Digitized by the Internet Archive
in 2018 with funding from
University of Toronto

https://archive.org/details/medjournalMar1941uoft

Volume XVIII Toronto, March, 1941 Number 5

The University of Toronto Medical Journal

(AN UNDERGRADUATE PUBLICATION)

This journal is published six times a year, November to April, by the Medical Society of the University of Toronto, to serve as a medium for student expression and to bring to the student recent articles of scientific interest.

$1.50 per volume. 25c. per single copy.

ADVISORY STAFF

Prof. E. A. Linell, M.D., Ch.B. Manc.
J. H. Couch, M.A., M.B., F.R.C.S. Edin., F.R.C.S. (C.)
J. Hepburn, M.B., F.R.C.P. (C.)
D. Y. Solandt, M.A., M.D., Ph.D. Lond.
A. M. Wynne, M.A. Qu., Ph.D.

EDITOR-IN-CHIEF
T. S. Wilson, B.Sc., '41

ASSOCIATE EDITOR
N. B. G. Taylor, '42

MANAGING EDITOR
T. A. Jamieson, '42

ASSISTANT EDITORS
D. P. Bryce, '42
C. G. Stewart, B.A., '43

WOMEN'S EDITOR
Miss L. T. Karmalska, B.A., '41

FEATURE EDITOR
A. M. Vaughan, '41

PRE-CLINICAL EDITOR
E. F. Routley, '44

ABSTRACT'S EDITOR
R. L. MacMillan, B.A., '41

PAGES FROM THE PAST
H. Bolley, '41

CIRCULATION STAFF
Manager—A. J. Denne, '41

Assistants—H. D. Diggs, '46; J. R. Gaby, '45; F. C. Jones, '44; E. Robertson, '43; R. D. Bell, '42

Address all communications to Room 107, Anatomy Building

Editorial

"ON LAB BOOKS"

Now we stick out our necks to condemn eternally the practice of keeping lab books, as the art is at present practised in this medical college. Lab books are a fine institution if they are a part of the lab—if they are done by the student's unaided efforts, but they are certainly a waste of precious time if they are a direct steal of a predecessor, or if they care more for the way in which a thought is arranged than the thought itself. A Lab book should be as much a part of the lab as the test tube, and it should be stained as much; not a neat replica of someone elses, copied out a night or two before the book is to be handed in. Actual results, no matter how removed from the correct one, should be written in the Lab book, and not a grand summary of the bright boy's work, ingeniously padded so as to make it look like a work of one's own. It is not too great a stretch of imagination to think of a demonstrator correcting some lab book, and finding his very own results which he had achieved while a student—or copied from somebody else!

We all know these lab books are handed down year by year, and there is hardly one of us who is not guilty, hardly one of us who has not a beam in his own eye. An honest "C" is far better than the enviable "A" if the former is due to ones own efforts and the latter is plagiarized from someone else. After all we are here to learn something; not to appear to learn something.

So let lab books be stained with H_2SO_4, let them be part of the lab, and let us not fool ourselves that we are learning anything when we neatly and cold-bloodedly copy a result and embellish it with caliper drawings. The fault, dear fellow students, lies as much with our teachers, as ourselves, for furthering such a practice, by expecting a stereotyped, neat, unsullied end product, which is still euphemistically called a "lab" book.

There is the other side of the question though, of course. One must admit that if a book is taken home in order to do some outside reading, the gems of which are going to be placed in it, that writing up a book at home may not be too criminal a procedure, if the material is not lifted bodily from another. It certainly is an awful temptation with a good book before one, not to capitalize on it, and save time, energy and brain power.

If anyone can see a solution to the problem, Faculty and students alike are open to suggestion. Until this suggestion and the millenium come, good students will always do their own work, we suppose, and poor students will not, and all in all, nobody will give a darn.

Applications for the following positions will be received by the Editorial Board, University of Toronto Medical Journal, up until April 1st, 1941:

EDITOR-IN-CHIEF—A VIth year student, next year.

ASSOCIATE EDITOR—A Vth year student, next year.

MANAGING EDITOR—Any year.

Applications by writing to 107 Anatomy Bldg.

ON PROBLEMS OF GENERAL PRACTICE

By MALCOLM CAMERON, M.B., F.R.C.S.(C.)
Special Demonstrator in Surgery, University of Toronto

"Knowledge and wisdom, far from being one,
Have oft times no connection."—COWPER.

Here and there throughout the Province officials of the Ontario Medical Association hear criticisms of the clinical instruction given by the Faculty of Medicine in our university. Recently I heard some final year students expressing a desire for some vicarious experience in general practice. They suggested articles in this journal. The Ontario Medical Association would, it would appear, offer a series of lectures that would present the problems likely to confront a young doctor as he offers his services to a community beyond the range of the large hospitals in which he has been trained. The author of "The Horse and Buggy Doctor" once passed some rather severe strictures on clinical teaching by specialists and instanced our own faculty as a glaring example.

Is any of this criticism to be justified? Some one may write an article that will prove certain of the allegations charged or implied but I beg leave to oppose them. From early boyhood I have been intimately associated with general practitioners of medicine, I was in general practice for a dozen years and I have been a teacher of clinical surgery for longer than most of my undergraduate readers can remember. I presume to know something about the problem.

The day is long past when a student is taught in lecture that symptoms *a. b. & c.* spell syndrome *d* and diagnosis *f* with treatment *g* as the one method of dealing with the patient. The late professors Cameron and McPhedran insisted that such a method was out of date and could not prepare a student to face the problems of practice. The inculcation of principles backed by a thorough course in the fundamental sciences formed the basis of their teaching and their successors have adhered to the tradition. Before their time W. T. Aikins and J. E. Graham had similar ideas so that ever since our Faculty was founded the ideal has been to so equip our students that on graduation he was ready to face a problem and reason his way to a solution.

It would be a strange state of affairs if a doctor should not at some time be confronted with a situation the like of which he had never seen. It happens to specialists in every department and it is quite as apt to happen to a country doctor. I am sure that Dr. Dafoe did not curse the late Professor Adam Wright because he had not been taught the technique of delivering quintuplets! He had been taught the principles which he applied to the unique situation. It was not due to specific teaching that another man opened a trachea with his penknife and kept the air passages free by the use of two hairpins bent into retractors and tied about the neck until he could procure a catheter or a tracheotomy tube.

Medicine is not a trade to be mastered in an apprenticeship. The undergraduate course in any worthwhile school is designed to train the minds of its students in order that they may be forever students, observers and investigators. The graduate will seldom go wrong in ordinary technique of practice. His difficulties are much more likely to arise from his lack of understanding of the way of life used by the people who consult him. There are no stock solutions to the problems of general practice. If there were they would be taught. Judgment is not an intuitive faculty. It is developed from experience and so the young practitioner can expect to equal or surpass his senior colleague in the techniques of examination or the interpretation of symptoms. He cannot expect to equal the best of his seniors in judgment until he has a mass of observed results from which to correct his calculated results. There will come a wonderful period in which they will approximate but the process cannot be taught. It is an individual development.

OCCUPATIONAL DERMATITIS

By E. J. TROW, M.D., F.R.C.P. (C).

Assistant Professor of Medicine in charge of Dermatology, University of Toronto

The protective function of the skin is very well known and it is not necessary to point out here how well it can perform its work under normal circumstances. Certain workmen labour under different conditions, however, and a breakdown in the effectiveness of its normal protective qualities may occur causing noxious and irritating agents such as lead, mercury or certain infections to be absorbed.

Cutaneous disease in industry has a nuisance value because of the large number of cases of erythema, heat rashes, minor pustular and limited eczematous eruptions. It is only fair to point out however, that repeated minor attacks may so decrease skin resistance that major attacks are invited and the workman completely disabled. While about 10% of all the workers in a rubber industry had some skin irritation only about 1% actually suffered from a skin condition sufficiently severe to be compensated. It is always advisable therefore, to watch your workmen showing signs of a breakdown and by careful changing of jobs or by the use of protective measures, serious disabilities may be prevented.

Bernadino Ramazzini, in 1700, wrote an excellent work about occupational dermatoses and made many observations that are just as true to-day as then. His text-book remained a standard work for a century, but soon was added to by English observers. Percival Pott, in 1775, noted the frequency of chimney-sweeps cancer of the scrotum and ascribed it to the soot ground into this area. Later, Willan, Bateman and then other writers in France, Germany and the United States one after the other added to our knowledge of occupational hazards until action in the form of laws and compensation for workmen is the rule in most civilized countries. A report from the United States Public Health Service shows that of six thousand compensated cases of occupational dermatoses the principal industries involved were: 1st, *Metal and machinery;* 2nd, *Domestic workers;* 3rd, *Food handlers*. A study of the records show that the average time lost was ten weeks.

It is only fair to say that by no means all of the skin diseases occurring in workmen are due to their contacts; because it has been shown repeatedly that certain individuals already have a skin susceptible to work irritants by existing skin conditions. For example: Not long ago I examined twenty-five workmen in a rubber industry suffering from skin eruptions and found only three cases definitely and wholly due to their work; many of the other eruptions were in no way related to their occupation and were fungous infections or eczematous conditions aggravated perhaps by occupation. A thorough knowledge of dermatological conditions is therefore essential in order that no injustice to the workman or the compensating Board be done. A brief discussion of the subject might be taken up under the following heads:—

A. Predisposing Causes
B. Diagnosis and Patch Testing
C. Treatment
D. Prevention

Predisposing Causes

The horny cells constitute the best defence of the skin and resist to a degree water, alcohol and even fairly strong acids, yet are dissociated by alkalies. The sweat and sebaceous material add to the protective quality of the skin and often dilute irritants to the point of rendering them innocuous; but on the other hand with such a substance as cement the sweat increases its irritating power remarkably by holding it in solution on the skin. The dark skin is generally more resistant than the fair skin and certain industries, as that of cleaning, where solvents are used freely, some selection of the workers might be used to advantage. One could sum up this part of the problem briefly

by stating that a dry skin is best in industries where gases and dust are present; whereas a moist skin might be better where liquid irritants are employed.

Season:—During the summer when workmen wear less clothing and perspire more freely they may increase the surface exposed, but on the other hand winter, with its hot dry atmosphere inside, alternating with cold outside, may be an important factor.

Other Skin Diseases:—Preexisting skin disease, especially if eczematous with itching, is very important and certainly increases to a degree the potency of any contact irritant. Those workmen suffering from seborrhoea are very definitely more easily sensitized to work irritants, and the same is true of many fungous infections. Cranston Low held the view that over 75% of all occupational inflammations were in part dependent on a preexisting skin condition, especially seborrhoea or fungous infection and eczematous states.

Cleanliness:—A clean environment as well as cleanliness of the workman is important because potential irritants are removed or prevented from reaching the skin. It should be noted, however, that the use of turpentine, gasoline and caustic soaps for cleaning up after work is in itself harmful and at times productive of a dermatitis.

Allergy:—It may be now stated that industrial irritants may be divided into two types, i.e., (*A*) Primary irritants—such as strong acids, alkalies, salts of metals, cleansers and physical agents—abrasions, heat, cold, etc. These primary irritants will produce inflammation of the skin in non-allergic persons if sufficient concentration and exposure is present. (*B*) Certain irritants are capable of bringing about a sensitization dermatitis in which a specific cutaneous sensitivity is an underlying factor. In the case of the type (*A*) irritant, a single exposure only is necessary whereas in the case of type (*B*) a well defined period of increasing sensitivity is necessary; a period during which the specific irritant may be handled with impunity unless in sufficient concentration to act as a primary irritant. After sensitization develops the workman reacts violently to very weak dilutions of the irritant. It should be stated that many primary irritants—such as certain acids, chromium, turpentine, gasoline, salts of metals, formaldehyde, etc., may also become specific sensitizers. A simple primary irritant may act by causing (1) a solvent action on the protective grease of the skin, (2) a solvent action on the protective horny cells of the epidermis, (3) by desiccation, (4) dissociation to form irritating compounds. All of these reactions are much more likely to occur in winter when the sebaceous and sweat glands are less active and the dryness of the atmosphere in home and workshop is excessive.

The irritants found to produce the phenomenon of sensitization are found in certain industries, and are dyes, formaldehydes, lacquers, turpentine, chromium, nickel, resins and munitions; and workers in these industries are more apt to be sensitized. The question of sensitivity is an involved one and rests on the degree of exposure and concentration of the irritant as well as the type of irritant and the workman. Experiments have shown that an eczematous workman is very easily sensitized by weak dilutions and this in itself should rule out eczematous workmen from such industries mentioned above. Workmen have been known to become hardened to specific irritants, that is to say they react at first, but by continuing work they become immune. In cases such as these a prolonged absence from work necessitates going through the hardening process again.

It should be noted that industrial dermatitis in a large number of cases is caused by primary irritants such as acids, alkalies, fat solvents, dehydrators, etc., and a relatively small number are allergic in type. This is not so, however, with the wearers of the finished products as specific sensitivity is the most frequent result and is proven by the fact that the majority of people can use and wear these products with impunity.

Diagnosis

The diagnosis of industrial dermatitis is often difficult to make and the simple

fact that a workman is exposed to irritants does not necessarily prove his condition to be due to his work. The more cases of so-called industrial dermatoses a dermatologist sees the more he is impressed with the frequency that other unrelated skin conditions are misdiagnosed. I have seen such diseases as scabies, psoriasis of the palms, rosacea, dermatitis herpetiformis and other infections skin-tested quite uselessly—the workman all the time receiving compensation. It would seem to be quite a useless procedure to do any sort of skin testing for a dermatological condition until a diagnosis has been made. This can usually be done by a careful questioning of the patient and an attempt made to select certain irritants that could be the offenders. It is quite easy to see that to test these cases blindly, because of the vast number of irritants, would be quite valueless.

Patch Testing

The most valuable single aid in arriving at the cause of a dermatitis is the patch or contact test. The technique as suggested by Wrong is as follows: A small quantity of the suspected substance is applied to the skin; this is turn is covered with a piece of linen and the whole covered by thin sheet rubber and fastened to the skin by strips of adhesive. The patch is allowed to stay on twenty-four hours and in a few instances longer. The following points in the interpretation of the patch tests should be considered:

(1) Apply near the site of the original eruption.
(2) Positive tests do not necessarily convict that substance and the reverse also is true.
(3) Check results of tests with clinical observations.
(4) In testing with full strength chemicals a positive test must be differentiated from a simple burn.
(5) Patch testing may even sensitize a patient to that substance.
(6) A strong positive patch test may cause a marked exacerbation of the original eruption. This has been a frequent experience recently with cases sensitive to a synthetic resin in clothing.
(7) The performance of patch tests before the workman is engaged in that occupation is of no practical importance since the worker never reacts to the first contact with a substance. An incubation period of from ten to fourteen days is always present during which sensitivity develops. Tests with ten well known eczematizing agents might indicate an eczematous tendency.
(8) Finally the history or presence of an eczema would change the character and reading of a patch test.

Treatment

A person becoming sensitive to a material with which he works and who cannot become hardened, as it were, to it, should seek some other occupation. It is quite rare to find a chronic persistent dermatosis due to industry since most eruptions of this sort disappear when the workman is removed from the irritant and this fact is one of the most positive points in diagnosis. Co-existing seborrhoea and fungous infections as well as constitutional ailments must always be considered and suitable measures instituted. Local applications should be of a bland protective nature since phenols, resorcin, tar, as well as antiseptics such as mercury are all sensitizers quite likely adding to the trouble. Fractional doses of unfiltered X-ray, 50 to 100R units may be used without danger and with excellent results. The use of oils such as olive oil, oil of sweet almonds, carron oil are helpful in removing scales and crusts followed by boric acid ointment, simple zinc ointment or Lassar's paste. One finds at times Unna's gelatine paste of great value, especially after the acute, moist and inflammatory stage has passed. Desensitization to contact irritants has been generally unsuccessful and I know of no case where it has succeeded though such a result has appeared in literature.

Prevention

1. The prevention of a dermatitis due to a primary irritant relies on two

factors (*A*) Mechanical means of protection, (*B*) Education of the workman.

2. The prevention of a sensitization type of dermatitis depends upon (*A*) Proper selection of the workers, (*B*) Prevention of exposure to irritating substances. (*C*) The early recognition of such a case and its proper treatment.

3. Personal cleanliness is very important and cleanliness about the plant such as exhaust fans, good ventilation, cleaning of floors and machines to remove irritants is very important.

ANSWER TO PROBLEM IN LAST ISSUE

By ERIC A. LINELL, M.D.
Department of Pathology, University of Toronto

Autopsy Report

On external examination there was wasting of the small muscles of both hands.

The stomach contained black semi-fluid material. The mucosa of the trachea was congested and the lumina of trachea and bronchi contained material similar to that in the stomach. The lungs were congested and oedematous.

The brain was somewhat small, weighing 1140 grams. It was normal on surface inspection. On gross section slight oedema of the cerebral hemispheres was seen and there was some congestion of the brain-stem.

The spinal cord showed nothing grossly abnormal. At the fresh post-mortem a portion of the spinal cord was removed under aseptic precautions and placed in a sterile solution of 50% glycerin and water for investigation of a possible virus infection.

Portions of the left brachial plexus, the right femoral nerve and of the vagus and phrenic nerves were removed as well as intercostal and deltoid muscle. None of these structures showed any gross abnormality.

Microscopical Examination

No motor end-plates were found in the voluntary muscle in teased preparations impregnated with Gold Chloride.

The left brachial plexus and the right femoral nerve showed severe degeneration of their nerve-fibres. Silver impregnation by the Gross-Bielschowsky technique demonstrated the neurofibrils to be broken into fragments which varied markedly in thickness. Clear vacuoles could be seen scattered through these severely degenerate, fragmented neurofibrils. In the same preparations many normal neurofibrils could be seen. With the Smith and Quigley modification of the Weigert technique for myelin sheaths many of the fibres of these nerves showed a break-down of the myelin into globules of varying size. This degenerative change in myelin sheaths was patchy in distribution. No completely demyelinated fibres could be recognized and many normal myelin sheaths could be seen. There was no microscopical evidence of inflammation in the peripheral nerves examined.

In the central nervous system the only significant pathological changes which could be related with the patient's terminal illness were found in the brain-stem and spinal cord. The facial nerve nucleus in the pons and the ventral horn cells of the cervical enlargement of the cord showed swelling of the nerve-cell bodies, severe chromatolysis of Nissl-granules in the cytoplasm and eccentricity of the nuclei of the cells. As in the peripheral nerves there was no evidence of inflammation in the central nervous tissue and the changes seen in these motor nerve-cells were considered to be consequent on the severe degenerative changes found in their axones in the peripheral nerves. In this connection it was of interest that the fibres leaving the spinal cord by the ventral roots of the spinal nerves showed much more severe degenerative changes than were visible in the sensory fibres entering the cord-tissue by the dorsal roots of the spinal nerves.

Summary

The pathological findings in this case are those of a rapidly progressive degenerative process mainly affecting the motor-fibres of the spinal and cranial nerves. The disease began in the nerves arising from the cervical enlargement of the cord. Within two days the nerves to the muscles of the lower limbs were involved. The phrenic nerves were paralysed by the time she was admitted to hospital and there was bilateral weakness of the muscles supplied by the accessory and facial nerves. A change in her voice was noted and, probably as a result of paralysis of her vocal cords, she aspired some of the contents of her stomach into her trachea and bronchi causing death by tracheal obstruction.

The cause of this acute wide-spread degenerative disease of peripheral nerves is unknown and the condition is therefore best described, at present, as acute degenerative polyneuropathy.

It is possible that a virus may be isolated from the spinal cord.

STRABISMUS—EARLY TREATMENT ESSENTIAL FOR GOOD RESULTS

By W. W. WRIGHT, M.B.

Associate in Ophthalmology, University of Toronto

Normal eyes will both fixate the same object, i.e., they will be "straight" and this is true not only when both eyes are open but when one is covered. This condition is called "orthophoria". When both eyes look straight at an object, when both are uncovered but one or the other eye will deviate under cover, we have a derangement of binocular fixation known as "heterophoria", and, according to whether the eye tends to turn in, out, or up under cover, we have the various subdivisions of esophoria, exophoria and hyperphoria. Heterophoria is a latent strabismus, and is present, at least to a very slight extent, in a very high percentage of people. On the other hand, when only one eye fixes an object and the other deviates, even with both eyes open, we have the condition known as squint, strabismus or heterotropia. The latter term has, during recent years, at least on this continent, come into very general use and is to be preferred, as the heterophorias and heterotropias are very closely related to each other. Heterotropia, like heterophoria, is divisible into esotropia, exotropia and hypertropia.

As esotropia, or convergent strabismus, is much the commonest and most important of these conditions, my remarks in this article will be largely confined to it, although much of what will be said is applicable directly or conversely to hypertropia and exotropia.

The ideal treatment of any pathological condition is to restore the part to normal, both in regard to appearance and function. This, in the case of a heterotropia, means not only that the two eyes should be apparently straight (a good cosmetic result) and not only that both eyes should have good vision, but that we should have as well binocular vision or, according to the more modern conception, normal motor, retinal and proprioceptive correspondence (a good functional result). This is, I realize, a high ideal at which to aim, and is unfortunately not obtainable in every case, but I believe that it is obtainable in the vast majority of cases, provided always that the case comes under the care of the oculist very early in its course. We have been stressing this point at the *Hospital for Sick Children* for many years and one is very pleased to note in the more recent literature the same point being stressed at other centres. For example, Luther Peter of Philadelphia some years ago said: "In monocular squint, one no longer hopes for a cosmetic result; single binocular vision is the goal". Another indication of the general realization of this point is that we now frequently see results classified according to various age groups instead of over all ages combined.

A number of years of experience in the treatment of strabismus has led me to the conclusion that early treatment is the one most important factor in obtaining good results, but, in order to see the cases early, we must have the co-operation of the general practitioner and the paediatrician, as it is by them that the child is usually first seen.

Let us now consider why early treatment is so important in obtaining good results. This can, I think, be done best by approaching the subject from the point of view of, firstly, *etiology*, and secondly, *effects*.

Etiology

I do not propose to enter into a discussion of the relative merits of the various theories of the causes of esotropia but rather to consider only the more generally accepted theories in so far as they throw any light on our present subject of early treatment.

(a) *The accommodation theory of Donders*—When two normal eyes are fixed on a distant object, both accommodation and convergence are at rest. The closer the object is brought to the

eyes the greater becomes both the accommodation and the convergence. These two functions, being always performed together, are associated. We can consider them analogous to conjugate muscles. Their centres are very closely related, and a similar degree of stimulus travels down the third nerves to the ciliary muscles in the case of accommodation, and to the internal recti in convergence. Now to the hypermetropic eye in a state of rest, all objects, even distant ones, are out of focus, but just as the normal eye can focus on close objects by the power of accommodation, so can the hypermetropic eye use the same power to overcome its hypermetropia and thus see objects clearly. In other words, the hypermetrope is using some of his accommodation even to see distant objects, and, when he comes to fix a close object, he has to use this amount plus the amount that a normal eye needs. The result is that he has to send a very strong stimulus to his accommodation. Now as we have said that the accommodation and convergence are very closely associated, the tendency in sending this strong stimulus to accommodation is at the same time to send too strong a stimulus to convergence with the result that the eyes over-converge, so that neither eye fixes the object. The next step is for both eyes to rotate to the right or to the left so that one eye fixes the object and the other is turned in, and we almost invariably find that the young patient chooses the better eye to fix the object, or, to put it another way, that the squinting eye almost invariably shows a higher degree of hypermetropia or astigmatism. (Where the refractive error is equal in the two eyes we are likely to get the alternating type of strabismus.)

This convergence excess does not develop suddenly into a constant esotropia. What usually happens is that somewhere between *two and four years*, i.e., when the child is starting to fix on close objects, the observant mother or nurse notices that one eye turns in. This is at first frequently noticed only at meal time and, at this state, one can at times get from a bright child a history of seeing double. Whether one can get a history of diplopia or not, I believe it is always present at first. This stage of spasmodic esotropia usually lasts for several weeks and in rare instances even for years. It is during this stage that we have the ideal time for treatment, i.e., before the esotropia becomes constant and the child learns to suppress the image of one eye. The treatment then consists of fully correcting the hypermetropia with glasses and thus getting rid of the underlying stimulus to over-converge. Glasses can be worn satisfactorily by a child of a year old. The late Dr. Bennett of Buffalo said: "No child is too young to wear glasses if needed" and with this statement I heartily concur—in fact I would go further and add "or to be operated on, if indicated".

(b) *The fusion theory of Worth*—Referring to Donders, Worth said: "The great physiologist let the first ray of light into this dark corner of ophthalmology and gave the first indication for a rational treatment of convergent squint. But he was mistaken in supposing hypermetropia to be the fundamental cause of the malady." In brief, Worth considered the essential cause of squint to be a defect (not necessarily an absence) of the fusion faculty. In the presence of this fundamental cause, the eyes are in a state of unstable equilibrium, ready to squint on slight provocation. This provocation may be supplied by a number of conditions, chief of which is hypermetropia. At any rate, whether or not we consider a defect of the fusion sense the fundamental cause, binocular vision is dependent upon the ability of the two eyes to fuse their respective images, and Worth has demonstrated that between the ages of *three and five* is the best time to develop this sense, and that after six years of age it is seldom worth while to attempt fusion training. So from the point of view of fusion, we have another reason for early treatment.

(c) *Nervous instability*—Later, the feeling grew that, although Donders' and Worth's theories are important factors in the causation of esotropia, there is a further underlying factor. Duane, to whose work we owe a great deal of our knowledge of strabismus, believed that an

esotropia usually develops out of a simple convergence excess to which is added a divergence insufficiency, and he stated: "The processes by which these changes take place are doubtless central, following, as Hoffman pointed out, the law promulgated by Sherrington, that excessive stimulation of the centre for one movement produces inhibition of the centre for the opposing movement". In other words, in cases of convergence-excess, the centre for convergent movement, being subjected to continuous overstimulation, becomes more and more active, producing a continually greater excess of convergence action and at the same time causing greater and greater inhibition of the centre for the divergent movements. Along the same line, Barkan says: "To our mind, Sherrington's law of reciprocal innervation might with benefit be applied to the neuromuscular apparatus of the eye in cases of squint . . . observations by O'Connor and our own researches have confirmed us in our belief that strabismus of relatively recent origin is in the nature of a habit spasm, that is, contraction and relaxation. According to Sherrington's law, such a contraction and relaxation would be inclined to persist and the longer it remained the greater would be its tendency to perpetuate itself". Further on in the same paper, he says: "By operation, the habit impulse is interrupted and the eyes are placed in a position that closely approaches parallelism". A little further he says: "It has been our practice to operate irrespective of age, as soon as it can be determined that orthoptic treatment and glasses will not remedy the deviation". The conclusions in regard to early treatment to be drawn from these quotations are, I think, obvious.

(d) *Vertical imbalance as an etiological factor*—When a child has a congenital vertical deviation (usually due to a congenital paresis of the superior rectus) it sometimes overcomes the annoying diplopia by tilting the head to bring the images on the same level. Far more often, though, I believe the child, being unable to fuse the images, learns to overcome the confusion by letting one eye turn in or out, thus widely separating the images and then, as in the ordinary cases, learns to suppress one image. Since examining for vertical imbalance as a routine, I have been surprised at the number of cases of esotropia (frequently those without much hypermetropia) that show a vertical imbalance. I have now little doubt that this is a much more frequent cause than we have previously thought, and also that failure to recognize it explains a certain number of our failures in treatment. As Duane said: "That this is the cause of the later squint in these cases is proved by the fact that in some of them, particularly before the lateral deviation has become inveterate, the latter disappears when the vertical deviation is relieved by an operation". Here again early treatment is obviously indicated.

Effects

(a) *Effects on the muscles*—In the early days, a congenital or acquired defect in one of the muscles of the eye—either a weakness of the external rectus or an overpowerful internal rectus—was looked on as the cause of esotropia, and, although a small proportion of cases is due to such defects, it is now generally recognized that weakened external recti and shortened internal recti are in the vast majority of cases the result, rather than the cause, of the esotropia. It is a matter of common observation that in the early stages, the outward excursion of the eyes is normal. Another significant common observation is that the eyes usually become straight under an anaesthetic. On the other hand, it is only natural if an eye is turned in for years that, from the constant stretching, the external rectus should become thinned, weak, and more or less atrophic, and that the internal rectus should become shortened. We have all had the experience of finding these conditions in long-standing cases and know the increased difficulty in getting good results. Why then wait until this late stage?

(b) *Amblyopia ex anopsia*—As its name implies, amblyopia ex anopsia is blurred vision of the eye from disuse. When an adult develops a strabismus, he suffers from a very distressing diplopia

which may last for months or even years before he learns to ignore or suppress the image of the non-fixing eye. A child on the other hand very readily learns to suppress the image of one eye and, from the time this suppression starts, the vision steadily deteriorates, except of course in the case of the alternating squint where the function is maintained because sometimes one and sometimes the other eye is used.

From a study of these cases, a number of very interesting and instructive observations have been made. The loss of vision has, for example, been found to affect largely the central or macular area, leaving the peripheral field intact. Again it was found that the earlier in life the suppression starts the more rapid is its progress and the greater its degree. An infant under a year old may lose the power of central fixation in a few weeks—at three years of age the amblyopia rarely progresses to the extent of loss of central fixation, although it may drop below 6/60.

As amblyopia develops from disuse, we would expect to restore the vision by making the child use the eye. This is indeed the case, but here again some interesting observations have been made, especially as to our limitations in restoring the vision to normal. Generally speaking, the longer the suppression has been present and the more profound the degree of amblyopia, the more difficult it is to restore the visual function to normal. Here again the age factor is an important one. The younger the child, the shorter is the period of suppression necessary to do irreparable damage. From his vast experience, Worth formulated as a general working rule that "if a child has had a constant unilateral squint for *half* of its life, there is not much use in trying to restore the vision". This rule we have found to work out very well in practice, although once in a while we get surprisingly good results when not expected, so that one feels that an effort should be made in every case, no matter how hopeless. However, in a child, say three years of age, who has had suppression for two years, if two or three periods of total occlusion of the good eye for ten days have not restored fixation, there is little use in persevering. Again, in any case with a marked degree of amblyopia, one gets *so little improvement after the age of six*, or at least seven, that it is questionable whether it is worth while when one considers the annoyance and discomfort to the patient. The practical point here is that, if the case is allowed to go until advised treatment by the school doctor, it is already too late in most cases to restore the vision to normal.

These observations about amblyopia ex anopsia add a further very powerful argument in favour of early treatment.

(c) *Morale*—The third effect that I will discuss very briefly is the effect on the child's morale. A cross-eyed child, when it gets to the school age, is able, especially if a girl, to develop a reaction of physical insufficiency, or to use the more hackneyed expression, an inferiority-complex, which may change the whole course of its life. On the other hand, I have noticed at times, and here especially in boys, a tendency to develop a scrappy, pugnacious manner in their contact with other children. This may be so marked that the boy may be classed as a bully. The psychologist would, I fancy, explain this reaction as a compensating one, i.e., a reaction to an earlier sense of physical insufficiency. This effect on the child's morale is, I believe, a sufficient reason in itself for early operation, and, further, I have found it an argument when urging operation that seems to appeal to the parents.

So much for the arguments in favour of early treatment. What is to be said on the other side of the question? There is the old idea that "they will grow out of it". While it is true that a certain percentage of cases do show a tendency for the eyes to straighten as they grow older, they do so at the cost of the useful sight of one eye. Our experience during the last war, when literally thousands of men were found ineligible for military service because of poor sight in one eye associated with a history of cross-eye in childhood, was quite sufficient in itself to end this wait-and-see attitude with its appalling economic results. The same condition is

being found in recruiting for the present war, but I believe to a less extent. Again there is the argument, especially prevalent on the continent, that operation should be postponed until it can be done under a local anaesthetic, as then the relative position of the eyes can be tested as the sutures are tightened. If the case has advanced to a state where amblyopia is permanently established and where the operation is only for cosmetic purposes, this point is worthy of consideration, but in the centres where this idea is in vogue they do not seem to have realized the possibilities of early treatment in restoring full normal function. Further, it has been found that, with experience, even better results can be obtained in young children under general anaesthesia, as what is left undone by the operation is made up for by the desire for fusion or normal retinal correspondence if the eyes are brought approximately straight.

In conclusion, let me say that, during the past twenty years, there has been a steady improvement in our results at the *Hospital for Sick Children*, due largely, I believe, to our seeing the cases at an earlier stage; but, in order to approach the ideal of one hundred per cent efficiency, we must see a far higher percentage of cases in the early stages and, as I said earlier, to do this, we need the co-operation of the general practitioner and the paediatrician.

NAPOLEON'S THREATENED INVASION OF ENGLAND

"The Alertness of our people, employed in several Yards along the Coasts never had a parallel. I reckon 11,000 Ship-Carpenters, and their necessary Assistants, Labourers, &c. employed here, and at Calais, Dunkirk and Ostend, besides those at Work on the Boats preparing at Ghent and Antwerp.

At Boulogne we have 36 Gun-Boats ready, each carrying Three Heavy Pieces of Ordnance, Two fore and one aft; besides 152 of what are called Flat-Bottomed boats. In three weeks time we expect to have as many more in a State of perfect Readiness.

At Calais, several of the floating Batteries, that opposed Lord Nelson when he attacked Boulogne, are now fitting up, and about 70 Boats, that will carry 150 Men each.

At Dunkirk, and the adjacent Calais there are 47 Gun-Boats ready, with remarkable heavy Ordnance, and not less than 200 Boats for carrying Men. They count upon being able to send 400 of these Vessels (great & small) to Sea in less than three weeks.

At Ostend, The Gun-boats, Floating Batteries, and vessels for carrying soldiers, will be completed in the present month, amount to 487. They work during the whole of Moon-light Nights."

(a broadsheet printed for J. Ginger, calculated to arouse the English public) 169, Piccadilly—1803-1804.

THE USE OF PHYSICAL THERAPY IN THE TREATMENT OF FRACTURES

By W. J. GARDINER, M.B., M.R.C.P. (Lond.)

Supervisor of Physiotherapy, University of Toronto

In the past, fractures have been treated by a great variety of methods. Before the days of X-rays and modern bone surgery both anatomical and functional results were very poor. Lucas-Championiére was the first to advocate and use massage and mobilization in the treatment of fractures. Although his methods were considered revolutionary at the time, and anatomical results were still poor, it was agreed that early massage and mobilization considerably improved the functional results. Later, with improved methods of reduction, anatomical results improved, but frequently, due to prolonged immobilization, patients were left with poor functional results. Physical therapy played an important, but late, part in the correction of swelling and limitation of movement in such cases.

To-day we believe that both a good anatomical and functional result can be obtained by proper reduction, immobilization, and the early use of physical therapy. It must be remembered that massage, mobilization, and other physical treatment are not methods of treatment by themselves, but are adjuncts to be used in combination with proper reduction and fixation.

There are few fracture clinics which now do not follow, in some respects, the teachings of Professor Boëhler of Vienna, as his methods in the treatment of fractures have produced results which are superior to any other previous methods. On his fracture service no physical treatment is employed, apart from muscular contraction on the part of the patient. Everyone will agree that massage and electrical stimulation of a muscle is of considerably less valuable than voluntary contraction, so consequently should be used only when a patient is unable to contract his muscles, or as a means of preparing a part for active muscular contraction.

Fractures in the region of the wrist and ankle are probably the best examples of Boëhler's methods. A fracture of the lower end of the radius, after reduction, is placed in an unpadded plaster cast, which allows the patient full use of the fingers. The frequent contraction and relaxation of the muscles of the forearm increase the circulation, diminish atrophy, and prevent the formation of adhesions between the tendons and their sheaths. This is important, as these adhesions can be a frequent cause of discomfort and limitation of movement after this type of fracture. Similarly, the different varieites of Pott's fracture, after reduction, are treated by complete immobilization in a walking splint. If the patient then walks freely, it is rare to find any functional loss after removal of the plaster. The contraction and relaxation of the muscles of the leg and foot, and slight movement of tendons, again prevent wasting and stiffness. Previous to the institution of this method, considerable numbers of Pott's fractures were referred for treatment because of muscle weakness, oedema, and limitation of movement; now it is rare to see one.

The same principle is applied in fractures of the surgical neck of the humerus. Following reduction, this type of fracture is immobilized by applying an axillary pad and bandaging the arm to the side. A sling is then applied, and over this two additional flannelette bandages are placed, binding the arm firmly to the trunk. In two to seven days physical treatment is commenced and is carried out daily. For the purpose of increasing circulation, aiding in the removal of extravasated blood from the soft tissues, and relieving muscle spasm, an infra-red heat bath and gentle massage are applied. This is followed by graduated active exercises. With the patient leaning toward the affected side, a weight of from three to five pounds is

placed in the hand. The arm is then swung through flexion and extension, and then, by leaning forward, through abduction and adduction, the so-called "pendulum" exercises. At the conclusion of the treatment, the bandages and sling are replaced. Treatment is carried out daily, progressively decreasing the heat and massage, and increasing the range and amount of movement. Bandages are discarded in from three to four weeks, and the sling a week later. If the technique has been carried out correctly this will result in a united fracture, and a full range of movement. During the past few years a considerable number of patients of varying ages have been treated at the Toronto General Hospital with highly successful results.

It must be remembered that there are other types of fractures in which physical treatment, as an adjunct to reduction and fixation, is of considerable value. Fractures of the femur, while in extension and traction in a Thomas splint, can be treated by means of infra-red, massage, surging Faradic stimulation, and static muscle contractions, with the object of increasing circulation, preventing atrophy and subsequent stiffness. In fractures of both bones of the leg, heat and massage can be used to increase circulation and decrease swelling before the application of a plaster cast.

Although the use of massage itself has decreased in the treatment of fractures, the importance of the masseuse has increased. In dealing with large numbers of fractures, it is usually impossible for the surgeon to give detailed instructions to each patient as to the particular exercises that should be carried out. Consequently, the masseuse can play an invaluable part in the instruction and supervision of active exercises, which are frequently extremely important in obtaining a satisfactory functional result, following a fracture. The purpose underlying the use of physical treatment is mainly to help the patient to help himself, rather than create the impression that he is the object of "passive" treatment.

SOME PROBLEMS OF CHILDHOOD

"The direction of the human mind and of the human personality cannot be adequately achieved through attention to man's physical well-being alone. We are convinced that the destiny of the individual is determined very largely by the experiences that come to him during the very early years of life, and it is our faith in the correctness of this principle that underlies the widespread belief among psychiatrists that the most substantial promise for the alleviation of at least some of the misery, unhappiness and failure of adult life, lies in a more intelligent management of the period of childhood."

W. M. Musgrove, M.D.

Can. Med. Ass'n. Jour., April 1927.

A PROBLEM IN DIAGNOSIS

By W. K. KERR, M.D.

From the Neurosurgical Service, Toronto General Hospital

The case is that of a 54 year old, Canadian farmer who was referred to the Neurosurgical Service of the Toronto General Hospital on November 21, 1940, presenting the following complaints:

I. Since 1933

1. Weakness of right arm and leg.
2. Weakness and marked wasting of right half of tongue and of right trapezius muscle.

II. Since 1936

3. Unsteadiness of gait and dizziness with a tendency to fall to the right side; unable to work.
4. Diminished sensation of the left side of his face.
5. Diplopia.
6. Deafness and ringing noises of the right ear.
7. Complete loss of voice.

III. Since 1939

8. Regurgitation and dysphagia.

HISTORY OF PRESENT ILLNESS

The patient was last well in 1933 when he began to have some weakness of his right arm and leg and to notice wasting of the right half of his tongue and of the right trapezius muscle. He was able to carry on with his farm work despite these complaints for three years.

In 1936, however, he had an attack of sudden, severe pain on the right side of his head, became suddenly deaf on his right ear, heard ringing voices in the right side of his head, lost his voice completely, became unsteady of gait, dizzy particularly when closing his eyes, tending to fall to the right side, and began to have double vision. The right-sided head pain disappeared spontaneously after a day, but the right-sided deafness and tinnitus, the aphasia, diplopia and ataxia have continued without much change since the attack four years ago, rendering the patient incapable of any farm work. During these four years he has also noticed occasional diminution of sensation of the left side of his face, the side opposite to that of his other symptoms.

Since 1939 he began to regurgitate food, have fluids come back up through his nose when swallowing and have solid food sticking in his throat. During the past year he has eaten less although having a good appetite, and has lost some weight and strength but was still able to be up and walk around on the ward. There was no history of headaches, nausea or vomiting.

PAST ILLNESSES:
PERSONAL HISTORY:
FAMILY HISTORY:
FUNCTIONAL INQUIRY:
} Irrelevant.

PHYSICAL EXAMINATION:

A 54 year old, somewhat emaciated farmer sitting or walking about the ward, of somewhat retired but otherwise normal behaviour.

Head and Neck:

Cranium—A pulsating bruit in the right occipital region below the superior nuchal line where a large artery can be seen pulsating deep to the origin of the atrophied right trapezius muscle.

Eyes—marked hyperopia.

Ears—Right chronic catarrhal otitis media.

Mouth and Throat—Right half of tongue and palate atrophied and paralysed.

Larynx—Right vocal cord paralysed.

Neck — Right trapezius markedly atrophied.

Chest—Clear.

Cardiovascular System:

B.P. 115/80; pulse 90 and regular; other findings negative apart from the bruit in the right occipital region.

Abdomen and Genitalia:
Back and Extremities:
Skin:
Superficial Lymph Glands:
} Essentially negative.

NEUROLOGICAL EXAMINATION:

Mental faculties intact.

Cranial Nerves:

1. Intact.

2. Marked hyperopia. Ophthalmoscopic examination shows some elevation of disc margins but no noticeable disproportion between veins and arterial calibre—a picture of pseudo papilledema. Perimetry shows some concentric constriction of fields on both sides and slightly enlarged blind spots but no field defect of localizing value.

3, 4 and 6. Convergence poor; otherwise eyes move well in all directions; some nystagmus of lateral limits of excursions on both sides, more on the right side. Pupils equal, round, react to light and accommodation.

5. Sensation of face diminished—left side. Left corneal reflex absent. Right corneal reflex present but diminished.

7. No facial weakness.

8. Can hear voice at $1\frac{1}{2}$ feet, right side; 12 feet, left side. Rinnés test negative right side. Weber's test referred to the right.

9 and 10. Palate deviates to the right. Gag reflex is absent on the right side. Sensation of palate is absent on right side. Right vocal cord is paralysed.

11. Right trapezius is markedly atrophied and without power. Right sternomastoid is slightly atrophied and with some power.

12. Protrudes tongue to the right. Definite atrophy of the right half of the tongue; no fibrillation.

Motor Function:

There is some diminution of power of right upper and lower extremities but no atrophy. Finger to nose, heel to knee and rapid supination and pronation tests are poorly done on the right side.

Sensation:

Light touch, pinprick, two point discrimination and sense of position is appreciated throughout but not as well on the right as on the left side. On the face, sensation on the left side is diminished and on the right side is normal.

Reflexes:

	Right	Left
Corneals	+	0
Biceps	+	+
Triceps	+	+
Abdominals	+−	0
Patellars	++	0
Ankles	++	0
Clonus	+	0
Plantars	Down	Down

Stance and Gait:

Patient falls to the right when standing with feet together and eyes closed.

He walks on a wide base, veers to the right, shows marked cross stepping and gives a typical picture of ataxia.

LABORATORY EXAMINATIONS:

Urine—negative.

Blood — Haemoglobin 85%; White Blood Count—10.0.

Blood Wassermann—negative.

X-RAY:

"Erosion and destruction of the posterior margin of the foramen magnum in the midline but with more involvement on the right side."

The author is indebted to Dr. K. G. McKenzie for his kind permission to publish this unusual case.

THE RETROPULSED INTERVERTEBRAL DISC AS A CAUSE OF LOW BACK PAIN AND "SCIATICA".

By J. B. ROBERTS, '42

The retropulsed intervertebral disk has become definitely established as an anatomical, pathological and clinical entity. Clinical recognition of this lesion, *now believed to constitute one of the major causes of pain low in the back with sciatic radiation*, followed the publication in 1934, of the work of Mixter and Barr at the Massachusetts General Hospital. Since that date a considerable literature has accumulated on the topic; over 500 cases have been reported from the Mayo Clinic alone.

The extrusion of cartilage from an intervertebral disk, as the result of trauma, seems to have been first mentioned by Virchow, in 1857. It was again mentioned, this time by Kocher, in 1896. That such a lesion might cause compression of spinal nerve roots was considered by Goldthwaite in 1911, and Stookey, in 1928, reported a series of seven cases of compression of the cord due to so-called "ventral extradural cervical chondromas," all of which were realized, later, to be protrusions of intervertebral disk tissue rather than neoplasms. In 1929 Dandy reported two cases of paraplegia in which he had discovered protrusion of a lumbar intervertebral disk. And so it has gradually been realised that certain lesions, once considered extradural growths of the spinal canal, are nothing but retropulsed fragments of nucleus pulposus, or annulus fibrosus, or both. These fragments are in no way associated with neoplasia.

The lesion may occur in any area of the vertebral column, but the disks most often affected are the fourth lumbar, (i.e. the disk between the fourth and fifth lumbar vertebrae) and the fifth lumbar or lumbosacral. Here we are concerned with protrusion of these disks only.

Anatomy

An intervertebral disk may be described as consisting of three parts:

(1) the cartilaginous plates covering the vertebral bodies above and below;
(2) the annulus fibrosus, and,
(3) the nucleus pulposus, the anlage of which is the notochord.

The nucleus pulposus is the soft elastic core of the intervertebral disk, situated either in the centre of the disk, or, more often, at the junction of the middle and posterior thirds. The nucleus is composed of fine interlacing bands of connective tissue, with occasional elastic fibres, incorporating various types of cells including connective tissue cells, fibroblasts, groups of cartilaginous cells, and some multinucleated cells with clear protoplasm; the latter are thought to be remnants of the chordal cells. A highly fluid matrix is contained in the meshes of this very loose tissue. Around the periphery the fibrous network gradually becomes denser, until it merges with the annulus fibrosus, a fibrocartilaginous structure.

Physiology of the Nucleus Pulposus

The nucleus pulposus, being a semi-fluid mass with a high water content, is normally under considerable pressure, and is subject to the laws of fluids. Therefore it can be considered incompressible, its normal shape and turgor depending on the integrity of the strong and somewhat elastic annulus fibrosus, and on its water content. The latter gradually decreases with age. The nucleus has a threefold function; as a spring to keep the vertebrae apart, as a shock absorber, and as a fulcrum for movements of the vertebral bodies upon each other.

Mechanism of Retropulsion

When sufficient force is applied over the vertebral bodies, with the spinal column in the position of flexion, the anterior aspect of the intervertebral disk is narrowed, with corresponding widening of the interspace from front to back. There results a tensing of the

posterior portion of the annulus, with a posterior bulging due to the shifting nucleus. If sufficient force is applied, one of two things may happen: there is either a sudden acute rupture of the posterior portion of the annulus with abrupt extrusion of the nuclear content, or, there is a gradual change in the posterior portion of the annulus with gradual loss of the resilience of that structure. There will finally be a rupture and escape of the nuclear content. In the course of the gradual rupture there may be recurrent bulging, producing intermittent exacerbation of the symptoms. In the earlier phase of disruption of the annulus, the posterior longitudinal ligament may prevent production of clinical symptoms other than transient backache. Ultimately the ligament will become stretched and permit the characteristic bulge of a posterior protrusion in a lateral aspect.

Etiology

Predisposing factors such as congenital weakness or degenerative changes of the disk are almost invariably present. The consensus of opinion is that the precipitating cause of retropulsion of the disk into the spinal canal is trauma to the back; repeated trauma may be necessary to cause enough protrusion for the production of the characteristic syndrome. The trauma takes the form of an accident such as falling while supporting a heavy load on the shoulders, or, lifting a heavy weight from a level which necessitates considerable flexion of the vertebral column.

The Clinical Picture

There is almost invariably a history of some sort of injury to the spine, recent or remote. Attacks of pain with periodic relief, partial or complete, are usually described. The pain originates low in the back, and is referred posteriorly down the thigh and laterally down the leg. In a great many cases, incapacitating pain low in the back precedes the sciatic radiation by weeks, months, or years. The pain is usually accentuated by coughing, sneezing, or straining at stool. Paraesthesias are often a part of the picture; the patients complain of tingling, prickling, electrical shocks, coldness or numb sensations in any of the involved dermatomes. These paraesthesias are usually not constant, but appear with certain postures, or on coughing, sneezing or straining.

A very characteristic feature of the history is the remarkable intermittency of the symptoms, which Walsh and Love found in 180 of a series of 200 cases. Several explanations have been suggested; one is that it is due to the periodic appearance and resolution of edema in the protruded fragment, causing an intermittent increase and decrease of pressure on the affected nerve roots. When the edema disappears, so do the symptoms, with the exception of slight residual stiffness and backache. Another suggestion is that occasional withdrawal of the protruded portion into the intervertebral space may take place. In support of the latter theory it has been found that in vertebral columns fresh from cadavers a partial return of a retropulsed nucleus pulposus into the interspace follows kyphotic flexion of the column.

The Physical Findings

Inspection of the Back: Stiffness of the lumbar portion of the spine with obliteration of the ventral lumbar curve is usually seen. This loss of normal lumbar lordosis is due to spasm of the erector spinae muscles, and is especially well demonstrated when the patient bends forward.

In a few cases the normal lumbar curve is actually reversed, and there is prominence of the spinous processes of the third, fourth and fifth lumbar vertebrae.

A fixed list (sciatic scoliosis) of the lumbar portion of the spine, occurring towards or away from the affected side with almost equal frequency is commonly noted.

Palpitation of the Lumbar Area: Local tenderness over the lumbar spinous processes and interspinous ligaments at the site of the lesion may often be elicited.

Limitation of Movement: All motions of the back are limited by involuntary

muscle spasm, but hyperextension is usually particularly painful.

Neurological Findings:

(*a*) A diminished or absent ankle jerk on the affected side is often demonstrated.

(*b*) Sciatic tenderness.

(*c*) A positive Lasègue sign. (This is performed with the patient supine. The thigh is raised to right angles with the trunk, and the leg, which has remained flexed, is extended on the thigh until pain begins along the course of the sciatic nerve. Without further movement of the leg or thigh the foot is passively dorsiflexed to determine whether this additional pull on the sciatic nerve exaggerates the pain).

(*d*) Sensory impairment.

The sensory changes are not always clear cut. Usually the lateral aspect of the leg is hyperesthetic, whether the protrusion be at the fourth lumbar disk or the lumbosacral disk. Protrusion of 4L disk, involving the fifth lumbar and first sacral nerves, will result in hyperesthesia of the anterolateral aspect of the leg with inclusion of the great toe; protrusion of the lumbosacral disk, involving the first and second sacral nerves, produces hyperesthesia of the posterolateral aspect of the leg with inclusion of the lateral aspect of the foot. Sensory changes may also extend to the posterior aspect of the thigh and the saddle region on one side, but usually no diminution is found above the knee. Testing with cotton-wool and hot and cold test-tubes frequently reveals a definite area of hyperesthesia where results with pinprick were debatable. Stimulation of the hyperesthetic zone may produce typical causalgic pain, limited to the area involved. The causalgia may overshadow the hyperesthesia.

It is well to remember that none of the neurological findings are peculiar to this clinical entity, since neoplasms along the course of the sciatic nerve or within the spinal canal may produce a similar picture.

Aids to Diagnosis

Determination of the total protein level of the spinal fluid is often of assistance. In a high percentage of cases it is found to be at the upper limits of the normal range (40 mg. per 100 c.c.'s of spinal fluid) or definitely above normal. A value of less than 40 mg. per cent does not exclude the possibility of a retropulsed disk, however. The raised total protein level is due in most cases to the exudation which results from irritation of the nerve roots, rather than to a block in the circulation of the spinal fluid. For this reason a false low value may be obtained if the fluid is withdrawn from too high a level. It is suggested that the lumbar puncture be done preferably at the level of the lumbosacral articulation, and the total protein determination be made on the first 2-5 c.c.'s of spinal fluid withdrawn.

When a presumptive diagnosis of protruded disk has been made, it is usually considered desirable to obtain radiological confirmation, although this is sometimes done away with if the neurologic findings are sufficient to permit accurate determination of the level of the lesion. Ordinary roentgenograms rarely show any characteristic defect, because the protruded fragments seldom contain bone or calcium in sufficient quantity to cast a shadow. For this reason it is necessary to resort to the use of some contrast medium for the indirect visualization of the protrusion. The contrast agent is injected into the spinal subarachnoid space, and the interpretation is based on the production by the protruded fragment of a characteristic filling defect in the lumbocaudal sac.

There is much debate as to whether radiopaque substances (such as iodized poppyseed oil or colloidal thorium dioxide), or gaseous contrast media (air or oxygen), are preferable. The former constitute irritant, slowly absorbed foreign bodies within the subarachnoid space, which, while excellent from the viewpoint of visualisation of the lesion, may cause an arachnoiditis. The gaseous media, on the other hand, are non-irritant and quickly absorbed, but they

do not give the same accuracy of diagnosis as the radiopaque oils. The ideal contrast medium, a non-irritating radiopaque agent that can be absorbed and eliminated through the spinal fluid, remains to be found.

The first sacral nerve may be compressed by a posterolateral protrusion of the lumbosacral disk without any indentation of the dura mater, because its dural sleeve emerges above the disk; therefore a negative X-ray report does not exclude the possibility of a retropulsed disk.

Treatment

When the diagnosis of protruded intervertebral disk has been *definitely* established, surgical intervention should be considered. Surgery is recommended because there is little hope of obtaining by any other means the complete and immediate relief of symptoms which an operation may produce. However, if operation is refused, or definitely contraindicated, physiotherapeutic measures such as local application of radiant heat, followed by sedative massage, and the employment of a suitable spinal brace, may produce considerable symptomatic relief. It should be remembered that flexion of the spinal column may cause a protruded disk to be drawn back into the intervertebral space, whereas hyperextension of the column may increase the protrusion. Temporary relief may be had at the hands of the chiropractic gentry, but manipulation where there is a definite protrusion is attended by considerable danger.

The usual surgical procedure is removal of the retropulsed disk through a laminectomy wound. Love has reported a series of twenty cases in which he was able, after resection of the hypertrophied ligamentum flavum, to remove the protruded disk without removing any bone.

Comment

The retropulsed intervertebral disk is now accepted as the pathological basis of many cases of low back pain and "sciatica" which have hitherto been diagnosed incorrectly or not at all. It is not suggested that all pains low in the back are due to this lesion; a syndrome with many similarities may be produced by neoplasms in the spinal canal or along the course of the sciatic nerve; by pelvic and rectal disease, and by disease of the osseous and ligamentous structures of the vertebral column. Sciatic pain may be the result of vascular disease of the legs and feet (thromboangiitis obliterans and arteriosclerosis). After thorough clinical xeamination together with diagnostic aids as indicated in the preceding pages to should be a matter of relative ease, it diagnose or rule out a protruded disk.

Perhaps the most important point about this syndrome from the aspect of the man in general practice is *to be aware of it;* it is a new clinical entity; as additional information of the lesion is acquired the entire picture of low back pain and "sciatica" will be clarified, and some of the old orthopaedic rationale will be relegated to an appropriate chapter in the annals of medical mythology.

FINIS

The author wishes to express his sincere appreciation for the constructive criticism of Dr. R. I. Harris.

POSTOPERATIVE COMPLICATIONS

By PETER MARCHANT '41

The success of any operation is measured by the end result obtained. This depends not only on the skill with which the operation is performed but, among other factors, on the absence of complications in the postoperative period. Grave sequelae may follow even simple operations, whether performed with general, spinal, local or no anaesthetic. The following is a brief account of some of the most common and more important complications, particularly those following abdominal operations.

EARLY COMPLICATIONS

1. Functional.

(a) *Vomiting.* Moderate vomiting may be present during the first day and does not require special care. After that time vomiting should not be dismissed too casually. A milk toxemia due to dehydration may cause vomiting, which subsides when the fluid balance is restored. Acidosis is a cause of vomiting but this is less prevalent now that preoperative purgation and starvation are no longer considered necessary. Fluids, glucose and alkali give prompt results. Nervousness is another common cause and may result in extreme anorexia nervosa. Sedatives are essential in the treatment of this. Alkalosis may result from excessive vomiting, due to loss of hydrochloric acid in the stomach contents. The giving of intravenous saline is followed by rapid recovery.

In all persistent vomiting more serious conditions such as intestinal obstruction, peritonitis, etc., must be ruled out. The main points in treatment are the prevention of dehydration by purgation, perspiration, or decreased fluid intake, the prevention of starvation and the maintenance of the acid-base balance of the body.

(b) *Abdominal Distension.* This is an almost constant sequel of abdominal operations, particularly those on the upper abdomen, and also occurs frequently following all types of operations. Among the causes are any things which tend to disturb the motor and secretory functions of the bowel. These should be reduced to a minimum and include preoperative purgation and catharsis, starvation, operative exposure to the air, drying, chilling and manipulation of the intestine, air swallowing and post operative retching, gagging and vomiting. Anaesthetics vary in their tendency to cause postoperative distension. One must always also keep in mind that abdominal distension may be an indication of incipient peritonitis, mesenteric thrombosis or intestinal obstruction.

Signs and symptoms, which usually appear on the second day, include sensations of tenseness and discomfort, crampy pains, the so-called "gas pains", if peristalsis is active, increased girth of the abdomen, increased tension of the abdominal wall, increased tympany and signs of disordered peristalsis.

Treatment: Prophylaxis plays an important part. Enemas and cathartics have no place in the treatment of abdominal distension. Frequent changing of position usually lessens distension and the use of pitressin and prostigmine prophylactically following operation is of value. The periodic insertion of a rectal tube will facilitate the escape of gas. Contrary to previous belief morphine does not tend to increase distension and may be given for pain. Heat to the abdomen will increase comfort and lessen distension. If the condition does not improve insertion of a duodenal tube with intermittent or continuous suction may be tried.

(c) *Acute Dilation of the Stomach:* This serious complication is fortunately rare. It tends to develop insidiously and may become fully established without betraying its presence by any warning symptom or sign. Its first feature is usually expectoration of a mouthful of watery fluid without much effort. Similar effortless regurgitations then recur at short intervals and the fluid becomes streaked with green or

black. If not unconscious the patient may complain of some gastric distress. Epigastric fullness may be present. As the condition progresses dehydration and alkalosis develop.

Prophylactic gastric lavage, particularly following operations on the upper abdomen, is advocated by some. Once the condition has developed continuous or repeated gastric lavage together with the administration of intravenous saline to offset the loss of fluid and chloride ions should be carried out.

(d) *Hiccough:* This distressing condition has various causes and due to this, treatment is frequently unsatisfactory. Serious complications, such as peritonitis must be excluded. Changing the patient's position in bed, loosening a tight abdominal binder or the removal of drainage material may give relief. Gastric lavage may abort an attack. Inhalation of mixtures of carbon dioxide and oxygen or even general anaesthesia may be useful in persistent cases. However, relief is usually transitory. The use of emetics and purgatives is usually unsatisfactory. As a last resort temporary or permanent diaphragmatic paralysis can be produced by phrenic crush or avulsion.

(e) *Disturbances of Urination*:

(I) Urinary Suppression: Excretory or secretory failure of the kidney itself is probably most commonly due to factors such as low blood pressure and dehydration. Treatment is therefore mainly prophylactic. Large amounts of intravenous isotonic, and in some cases hypertonic, glucose may promptly re-establish renal function.

(II) Postrenal Anuria: May be due to periureteral edema, extraureteral tumours, inadvertent section or ligation of the ureter and other causes. It is most common following pelvic operations.

(III) Urinary Retention: This is one of the most frequent postoperative complications, particularly following operations about the bladder, pelvis and perineum. It may be due to psychic causes, local painful reflexes, obstruction, or atony of the bladder. Local operations such as prostatectomy require the use of an indwelling catheter for some days postoperatively. Opinions differ on whether the effects of retention and catheterization are harmful or not.

The patient who is taught to void in bed before operation has a far greater chance of being able to void post operatively. The bladder should probably not be allowed to become too distended but the patient should make strenuous attempts to void spontaneously before catheterization is considered. If distension is severe it is wise not to empty the bladder completely but to only remove about twelve ounces at a time.

2. Haemorrhage:

Injury to blood vessels occurs in every operation. The operative bleeding is usually not sufficient of itself to produce marked symptoms, but when added to other factors may contribute to the production of shock.

Reactionary Haemorrhage: During an operation the blood pressure tends to fall, particularly when spinal anaesthesia is used. The pressure may then be too low to cause real haemorrhage in the operative field, but as the blood pressure rises in the first few hours of recovery it may become sufficient to force the temporary clot out of the mouth of a vessel or blow off an insecurely tied suture. Oozing from veins may begin. Massive haemorrhage may take place or local haematomas may form which interfere with healing and offer a good culture medium for invading bacteria.

Treatment is mainly prophylactic, directed towards maintaining blood pressure, by preventing blood loss and shock and by the use of ephedrine and epinephrine with spinal anaesthesia. Time is well spent in proceeding more slowly and carefully searching for and securely tying off all vessels. Ice-bags applied to the wound may lessen haemorrhage. The preoperative administration of vitamin K to jaundiced patients decreases their tendency to bleed. If severe haemorrhage occurs the wound should be reopened and the

bleeding point sought for and tied. Haematomas usually reabsorb slowly and should not be interfered with because of the danger of infection.

3. Shock:

Shock sometimes follows surgical operations. Factors contributing to its production are rough handling and exposure of tissues, rapid severe haemorrhage and the anaesthetic. Abdominal and thoracic viscera are particularly sensitive to trauma. The length of an operation is less important if it is carried out with care and gentleness. Loss of body heat is another important factor.

Clinical features include a profound fall in blood pressure, pallor and coldness of the skin, sweating, rapid shallow breathing, rapid thready pulse, apathy and lowering of body temperature.

Much can be done to prevent shock. Preoperative preparation of the patient, so that he is in the best possible condition both physically and mentally, should be carried out. Care must be exercised in the choice of an anaesthetic, in the handling of tissues and in the prevention of drying and cooling of exposed organs. Dehydration should be avoided. When shock is present body temperature should be maintained by blankets and hot water bottles. Intravenous fluids or blood transfusion may be indicated.

4. Infections:

(I) *Wound Infection:* Infection of the operative wound may be superficial or or deep seated. The presence of necrotic or devitalized tissue and blood predisposes to infection. Symptoms depend somewhat on location but are mainly those of any infection. The severity may vary from simple stitch abscesses to severe cellulitis depending on the organism present. The prevention of dead spaces, haemorrhage, and trauma to tissues are prophylactic measures. If infection is present the stitches should be removed, the wound opened and treated as any other infected wound.

(II) *Peritonitis:* This is now a rare complication of surgery, due to the advance in surgical and aseptic technique, but it must however always be kept in mind following abdominal operations.

(III) *Cystitis:* Though opinions differ the majority of observers believe that the normal urinary bladder is not easily infected as the result of instrumentation. However, cystitis sometimes develops after catheterization. If catheterization is done the urine should be repeatedly examined for signs of infection. The prophylactic use of mandelic acid is advocated by some.

(IV) *Parotitis:* This complication is seen following all types of operations with all types of anaesthetics and usually in patients whose general condition is poor. Most cases are due to extension along Stenson's duct. Trauma may play a part, and dehydration resulting in diminished salivary secretion is probably important. Symptoms are a painful, localized swelling in the parotid region accompanied by fever, rapid pulse and leucocytosis.

Prophylaxis includes careful attention to oral hygiene, prevention of dehydration, the stimulation of salivary secretion, and the avoidance of trauma. When parotitis develops, attempts to keep the duct patent should be tried and local heat applied to the gland. If suppuration occurs the abscess must be opened and drained.

(V) *Pneumonia:* Pulmonary complications are among the most serious postoperative complications and are more common in older patients. Following all types of operations the morbidity is about three per cent and forty per cent of these die. Following operations on the upper abdomen the morbidity is about ten per cent. Pneumonia is one of the most common. Atelectasis and hypostatic congestion are important factors in the production of pneumonia. The former develops when breathing is shallow due to pain or any other cause and when air is prevented from entering part of the lung. The latter is favoured by immobility.

Prophylactic measures decrease the incidence of postoperative pneumonia. Frequent, careful changes in position

will diminish hypostasis. Respirations can be stimulated by the inhalation of carbon dioxide. Nothing, such as abdominal binders or tight dressings should be allowed to restrict abdominal movement. Signs and symptoms are those of ordinary pneumonia and the treatment is the same.

5. Massive Pulmonary Atelectasis:

This complication is not uncommon yet its etiology is unknown. It may involve one lobe or the whole lung. The onset is sudden, usually twelve to thirty-six hours postoperatively, with dyspnea, cyanosis and slight cough. Fever, tachycardia and rapid respiration are also present. Pain in the lower chest is almost constant, a chill is not uncommon and there is always a leucocytosis over ten thousand. Signs are similar to those of pneumonia except for marked shift of the mediastinum to the affected side. Râles may be heard. Treatment consists of prophylaxis by stimulating deep respirations. Once it has occurred coughing and deep breathing should be encouraged, using five to ten per cent carbon dioxide. The prognosis is excellent because the symptoms usually disappear in a few days though it may be complicated by bronchopneumonia.

6. Thrombosis and Thrombophlebitis:

In every wound thrombosis inevitably occurs. Thrombosis is also prone to occur in certain large veins, particularly the pelvic and iliac veins even when not related directly or indirectly to the operative field. Stasis, traumatism and infection play important roles in its production. Cases of sepsis are particularly prone to develop thrombophlebitis. Pelvic thrombosis is most common and usually presents no pathognomonic symptoms. The femoral vein is most commonly involved in diagnosed cases. Mesenteric thrombosis is a serious complication and is fortunately rare. It is usually only diagnosed at autopsy.

Prevention includes delicate handling of tissues, rigid asepsis and active movements in bed as soon as possible. The greatest importance of thrombosis is the danger of embolism.

7. Disruption of the Abdominal Wound: (dehiscence).

This may occur with or without evisceration and is a rare complication. It is difficult to treat and carries a high mortality. It is most apt to occur in protracted illness in patients whose general condition is poor. The diagnosis is usually simple and frequently made by the patient himself. The diagnosis calls for immediate surgical intervention.

LATE COMPLICATIONS

1. Embolism :

Embolism may be caused by a thrombus, by fat, or by air. The occurrence of large emboli is relatively infrequent but their disastrous results make them important. They usually tend to occur about seven to ten days postoperatively and frequently about the time when the patient is beginning to resume his normal activities.

(*a*) *Pulmonary Embolism:* The onset is sudden with severe substernal pain, cyanosis, dyspnea, tachycardia, fever and unconsciousness may develop. Death may occur in from a few minutes to days. Bloody sputum usually develops and pleurisy developing in a few days confirms the diagnosis. Differential diagnosis includes cardiac infarction or acute cardiac or vasomotor collapse.

(*b*) *Peripheral Embolism:* Acute arterial occlusions produce both motor and sensory paralysis. The skin is pale and clammy and the pulse is absent. Pain is severe. The axillary, brachial, common iliac, femoral, and popliteal arteries, and the aorta are the most common sites.

(*c*) *Fat Embolism:* This is most common following fractures and *air embolism* following operations near the large veins of the neck, axilla and pelvis.

Treatment is mainly directed towards the prevention of thrombosis and, if this has developed, the prevention of emboli by absolute immobilization of the affected part. Once embolism has developed, early embolectomy may be attempted. This is most successful in peripheral embolism. Attempts may also be made to increase the collateral circulation.

2. Secondary Haemorrhage:

This usually occurs several days after the operation and is due almost exclusively to infection involving the wall of a large vessel interfering with the formation of a permanent clot. Trauma is probably important because the unimpaired adventitial coat is very resistant to infection. It is not a common complication now due to aseptic surgery.

3. Failure of the Wound to Heal:

Several factors may be involved. Decreased blood supply will hinder healing and this may be brought about by edema of the tissues, too tight dressings and sutures which are tied too tightly. Haemorrhage into the wound separates living tissues and increases the amount of work the living cells must do to bridge the gap. Necrotic and devitalized tissue and foreign bodies, such as sutures and drains, interfere with healing and along with blood provide an excellent culture medium for bacteria. Infection is the greatest handicap to healing. The treatment of all the above suggests itself.

4. Fistula:

Prolonged drainage of the abdominal cavity may result in the formation of a fistula.

5. Adhesions:

All laparotomies are probably accompanied by the formation of adhesions. If the parts are properly protected and no infection is present these adhesions are ordinarily only temporary or filmy structures. Following infection adhesions are almost sure to form, though most of these are symptomless. Occasionally they may produce symptoms of acute or intermittent obstruction.

Withdrawal of drainage tubes as early as possible is important. Whenever possible the omentum should be interposed between the intestines and the drainage tract and the intestines should be carefully placed in their normal positions to avoid kinking.

6. Incisional Hernia:

Etiological factors are drainage of a wound, infected wounds, haemorrhage into a wound, improper closure of clean wounds and the use of inferior suture material. The majority of these hernias start within a few weeks or months following operation.

Prophylaxis includes the careful suturing of wounds, particularly the peritoneum and transversalis fascia, removal of drainage tubes as early as possible, the avoidance of infection and the formation of haematomas.

Postoperative Psychosis:

Not infrequently both before and after operation patients, probably with an already abnormal nervous mechanism, develop psychoses. These vary in degree and are characterized by fears of death or mutilation, confusion, hallucinations, delusions and excitement. It is important to recognize their presence or the possibility of their occurrence before the operation is done.

The author is grateful to Dr. J. H. Couch for his assistance in writing this paper.

DEATH: A BIOLOGICAL PHENOMENON

By HENRY Z. SABLE, B.A. '43

It has been said that "Man alone, among all the animals, knows that he must die." We are probably not far wrong in assuming that the problem of death has been one of great interest to mankind since prehistoric days. It has always been an intangible, usually awesome matter, and on this account it has played so important a part in the culture of all peoples. For this reason, in addition to the purely biological aspects, a brief reference to the more metaphysical considerations might be appropriate.

A large part of most primitive religions consists of worship of the dead, and preoccupation with death, although this may manifest itself in different ways. The nearly universal custom of providing worldly belongings for the use of the deceased, is proof of the incomprehensibility of death, and we are still not free of the idea that it is nothing more than a transmutation from one form of life to another. I cannot presume to enter upon a discussion for or against such purely religious views, since I am not qualified to do so, but in the latter part of this article I shall proceed on the assumption that this conception does not, at any rate, represent the whole truth.

One of the problems arising in any discussion of death, is that concerning individuality. Granted that the body ceases to function, there has always been the unanswerable question: "Where is that complex of traits that we have been accustomed to consider as the individual?" Certainly it is difficult to define the term "Living individual", and for this reason it is still more difficult to say what becomes of the individuality as a result of the process we call death. Marshall expresses this difficulty very succinctly when he says: "If we have an ameba called Tom, which proceeds to divide into amebae called Dick and Harry, what has become of Tom?" Where and what is the individual?"

Any consideration of the biological aspects of death may include, among other topics, the actual physical, chemical and structural changes that are involved, the causes and probability of death, and a discussion of the population problem. It is almost superfluous to say at this point that it will be impossible to do more than touch a few salient features and quote a few opinions on any one aspect.

It has long been known that not all the body dies at once. We say that the body is dead when the heart stops beyond recovery, but we know that hair continues to grow for some days, cilia continue to beat, leucocytes remain active, hormones and enzymes removed from dead animals satisfactorily overcome deficiencies in the living body, and blood removed from cadavers has been used successfully in transfusion. Excitable tissues also continue to respond to stimuli.

Historical

In the enthusiasm of the post-Darwinian period, Weismann propounded his famous thesis that death was not an inherent quality of living protoplasm, but was an adaptation, advantageous to the race, developed and maintained by natural selection. "Let us imagine," he says, "that one of the higher animals becomes immortal; it then becomes perfectly obvious that it would cease to be of value to the species . . . it would still suffer certain injuries to one or other parts of its body. The injured parts could not regain their former integrity, and thus the longer the animal lived, the more defective and crippled it would become, and the less perfectly would it fulfil the purpose of its species . . . by natural selection life would be shortened by the amount . . . which would afford the existence of as large a number as possible of vigorous individuals at the same time." "To the metazoan, unending life would be a useless luxury." This attempt to settle purely biological problems such as that of the origin of death by the application

of logic alone cannot be accepted without great reservation.

Metchnikoff believed death arose from the long continued absorption of toxic materials produced in the intestine by bacteria. However there is no way of proving this theory, and there is much evidence against it.

Johannes Muller, Cohnheim, and others believed that the degree of longevity is predetermined in the inherited biological characters both of the individual and of the species.

The modern view is that life is a series of inter-related, delicately balanced physico-chemical processes, which obey all physical and chemical laws, and that death is not an inherent concomitant of these processes, but a relatively new phenomenon that has arisen because (and not until) great differentiation in structure and function has appeared during the course of development. Death is then a breakdown of the normal relationship that exists among these processes.

Senescence

I shall not discuss in any detail the histological changes observed in dead and dying tissues, but shall confine myself to some of the principles governing these changes.

According to Conklin, the most important structural peculiarity of senescence is the increase of metaplasm (i.e. differentiation products) at the expense of the general protoplasm. This change is an essential feature of embryonic differentiation and continues in many types of cells until all the cells are almost filled with the products of differentiation and metabolism. Since nuclei depend on cytoplasm for their growth, they also become small in such cells. However, under proper conditions it has been demonstrated that the cells of higher animals may be immortal. Carrel's famous tissue culture of chick fibroblasts lived for nearly thirty years before the experiment was stopped. Leo Loeb, Carrel, and Chambers have carried out further work that proves conclusively that the essential tissues of the metazoan body are potentially immortal. *It is the differentiation and specialization of function of the mutually dependent aggregate of cells and tissues which constitute the metazoan body that brings about death, and not any inherent property of the cells themselves.*)

The duration of life of an individual is regulated by the number of times each cell can be replaced when worn out. This replacement occurs by simple cell division, which is an exhausting process. "The power of growth diminishes continually though somewhat irregularly throughout life." Finally the rate of replacement becomes less than the rate of wear, and the size of the body, as well as its efficiency, decreases (Langdon-Brown).

Chemical Changes in Necrobiosis

The changes that occur when cells are dying are well known, and in the following discussion these will be briefly reviewed and correlated.

Cells that stain one colour when dying, stain a totally different colour when fully dead. Most of the stains used in histological work are acid-base indicators as well, and all such staining techniques indicate that protoplasm, which is normally basic, becomes acid when it dies. This conclusion is borne out by micro-injection of dyes into the intact cell.

There are, of course, many factors involved, and in certain plants, the cytoplasm is normally acid, becoming neutral after death. This is due to a migration inwards of hydroxyl ions, and not to any change in the cytoplasm itself, which actually becomes more acid.

Autolysis occurs: enzymes which were previously inactive now become active. This may be due to the fact that the protoplasm becomes more easily attacked, or because the enzymes were previously combined with other substances and now become released and relatively activated.

The profound chemical changes that occur when protoplasm dies have led some observers to the conviction that during life all the components of protoplasm are combined in a single gigantic molecule.

Living protoplasm is very labile, but this property is lost after death. Pfluger believed that the protein of living cytoplasm contained free CN groups, to which he ascribed the lability, but Emil Fischer showed that protein contains neither CN or nitrile groups. Verworm believed that a protein substance he called "Biogen" was responsible for the maintenance of life, and he stated that when this substance broke down, death ensued.

All evidence indicates that the proteins present in the nucleus and cytoplasm of plants and animals are in a conjugated form. Lipoids, mineral salts and carbohydrate make up the remainder of living protoplasm. Some of this evidence will now be reviewed. Careful studies of permeability of the functional cell membrane (i.e. the surface layers of protoplasm) to fat soluble and water soluble materials brought to light many facts that lead to the conclusion that, in these surface layers at least, lipoids and proteins are closely associated, possibly even bound chemically to one another. However, when protoplasm dies it loses its powers of selective absorption and becomes equally permeable to all materials, the lipoids no longer affect the permeation of water soluble compounds and this has been taken as evidence that the relation between lipoids and proteins has been destroyed. Further work shows that not only the boundary zone, but all protoplasm consists of such lipoid-protein complexes. Free lipoids and free proteins bind dyestuffs, but the bulk of the material of living cells does not, and this again points to the fact that living protoplasm contains no free protein, lecithin or other lipoids. These substances appear in the free state when protoplasm dies or is damaged. These views are strengthened by ultramicroscopic studies which show that in living, undamaged protoplasm there are no visible colloidal particles, and that these do appear when the cell is damaged or dead.

Heat and radiant energy are liberated during the processes of necrobiosis, in small but definite amounts. Necrobiotic rays occur during the hemolyses of red blood cells, the wavelength of the rays corresponding to the "molecular heat" of the hemoglobin-lipoid complex that makes up the protoplasm of the red blood cells. Other work has led to the assumption that "mitogenetic rays" are liberated by certain enzymatic processes.

Lepeschkin has named the lipoid-protein complexes "vitaproteids" (or "Vitaids" for short). To this complex, also, are linked other organic radicals, as well as mineral salts. In the cell, according to him, compounds are very unstable, as are all compounds whose formation is associated with the uptake of energy, and they break down upon very slight changes in the chemical structure of their constituents. They are also remarkable in the fact that they decompose under mechanical stimuli. Since they are highly complex substances, they liberate not free lipoid and protein, but simpler lipoprotein materials. Vitaids, like proteins, in general, are not only of high molecular weight, but are also highly polymeric compounds. It is quite evident that the molecules of vitaids can combine with molecules of other organic compounds, and that such combinations immediately break down when death occurs. Thus, combinations of enzymes, toxins, hormones and so on, with vitaids are conceivable.

The activity of lecithin is markedly depressed even when it forms absorption complexes with proteins. We are therefore not surprised that its activity is depressed when it takes part in the formation of vitaids. When death occurs, it and other phosphatides will be liberated, and these undoubtedly contribute greatly towards the increased acidity that occurs after death.

Lepeschkin develops his theory further: in all likelihood the lipoids and proteins vary considerably depending on the type of cell. During the death of yeast cells, heat is liberated in the early stages, and necrobiotic rays are not emitted until the late stages. This would indicate the presence of different vitaids within the same cell. This variation in the building stones of vitaids may also serve to explain the

fact that necrobiotic processes vary in different cells. The various materials liberated in cellular decomposition have differing physical properties; if they are not water soluble, their molecules will immediately combine to form visible particles and then granular degeneration or coagulation can be seen. Lipoid liberated in dying protoplasm will accumulate in the form of droplets. The colloidal particles of lipoid liberated by red blood cells during hemolysis have actually been observed.

According to Lepeschkin and others the solvent material of living protoplasm is not water, but some unknown organic fluid. If we assume that vitaids play an important part in the constitution of this fluid, then the uptake of water and increased permeability of protoplasm during necrobiosis can be explained. Furthermore, the amount of protein liberated progressively increases, and the amount of solvent material steadily decreases, the viscosity becomes greater and greater, and finally coagulation occurs. The dissolved water, however, forms vacuoles, and finally it becomes the solvent of the whole system. The gradual decomposition of the solvent leads to the destruction of the colloidal system of living material, and its substances either become dissolved in the surrounding water, or are coagulated, so that vital processes become impossible.

Public Health and Population

The actual duration of life is, of course, a very interesting problem. Intensive actuarial study of vital statistics has given us comprehensive "life-tables", without which no life insurance company could exist. These tables and graphical representations of the expectation of life have been classified and cross-classified in many ways. The relative importance of the various causes of death in different age-groups, the actual causes themselves, as well as the changes in the expectancy of life, have all been considered in numerous studies. Far from being haphazard, the study of vital statistics is most accurate, and rigid mathematical equations which express the facts very concisely are to be found in most of these studies. Pearl's excellent monograph on the Biology of Death should be consulted for a general discussion of the subject.

Analyses have been made of vital statistics derived from various sources, and the conclusion has been reached that inheritance is one of the important elements, possibly even the dominating factor determining the duration of life. This conclusion has been borne out by carefully controlled experiments on animals as widely separated as the fruit-fly and the rat.

Just as it is possible to express the expectation of an individual's life in mathematical terms, one can represent the growth of population in a country by a graph, and even predict, from this graph, future trends in population. In 1910, the population of the United States was 95,000,000 and a graph drawn then indicated that in 1939 the population should be very close to 130,000,000. In the intervening 30 years, war, restriction of immigration, changes in birth and death rate and other factors operated in a way that seemed likely to change the natural growth of population. Yet the result of the 1939 census was astonishingly close to the predicted figure.

Curves show that in 1920 the population of France had almost attained a stable level, and may be expected not to increase by more than a million between the time of writing and the next millenium. Very likely the phrase "Forty million Frenchmen" will still be applicable at that time. On the other hand, a similar curve shows that the United States, in 1920, was in the very middle of an estimated 150 years of maximal growth and was not expected to reach a stable level for 80 years, at which time, the curve predicts, the population will be 190,000,000.

It is not unreasonable to state that an appreciation of the laws governing these changes will be of considerable value in understanding the history and development of any nation.

We are not startled by the fact that the expectation of life is increasing—we expect it to be so. As we learn more and

more about the principles of hygienic living, as these principles are incorporated into our way of life, any group will naturally be permitted to attain a much greater age than a similar group of even twenty years ago. This leads to changes in the age distribution of any population, and will create certain problems in national life which formerly did not exist.

The duration of life is closely related to the growth of population. We are controlling the death rate; a question that many workers in this field have asked is: "What are we going to do about the increase of population?" Many answers have been suggested, but few attempts to solve the problem have ever been made on a large scale. Whatever the ultimate solution may be, the problem is at present a great one. Pearl—1922— wrote: "Malthus, whom every one discusses, but few take the trouble to read, pointed out many years ago that the problem of population transcends, in its direct importance to the welfare of human beings and forms of social organization, all other problems. Recently we have had a demonstration on a ghastly gigantic scale of the truth of Malthus' contention. For, in the last analysis, it cannot be doubted that one important underlying cause of the Great War, through which we have just passed, was the ever-growing pressure of population on subsistence."

It is difficult to draw any conclusions from the available evidence. The important advances in this field justify the hope that in the not too distant future it will be possible to incorporate all the facts in an adequate theory.

AN EPIGRAPH

Beneath this confecrated ftone
Lies the dear partner of my bed;
In happier days to him alone
I gave my plighted hand, and faid:
Long as the period fate allows,
Fix'd in its choice my heart fhall be;
And only death divide the vows,
I now prefer to heav'n and thee.
Too foon, alas! abfoly'd I stand,
And with fuccefslefs forrow mourn
O'er holy Hymen's broken band
And joys that never muft return!
But fince the pow'r who rules above,
Permits me yet on earth to live,
Accept this token of my love:
'Tis all thy weeping wife can give.
(Suppos'd to be written by a Gentlewoman) 1738.

DYSPEPSIA

By R. J. COWAN, '41

A wise old philosopher asserted that a good reliable set of bowels is worth more than any quantity of brains. Most of us will agree that as far as being conducive to human happiness and a feeling of well-being is concerned, the possession of a smoothly functioning gastro-intestional tract is a thing more to be desired than intellectual supremacy. Although we are well aware of this, we are prone to sniff at the symptoms of dyspepsia as being of any clinical significance, not to consider them, and then pass on to favour some associated evidence which indicates the source of the disorder. Granted that a diagnosis is made only by the presence or absence of other symptoms, the fact that one fourth of a physician's practice, list dyspepsia amongst their complaints, sufficiently justifies the presentation of a classification of dyspepsia with some discussion of the differential diagnosis.

The definition of dyspepsia varies according to individual interpretation. The term has been frowned upon for many years, but it cannot be discarded, because there is as yet no better one. Briefly it embraces epigastric distress or pain, anorexia, gaseous eructations, regurgitations, food intoleranee, heartburn, nausea and vomiting, all of which refer to disordered function of the stomach; also at times headache, constipation, faintness, general weakness and nervousness. The classification into the four types of *organic*, *reflex*, *systemic* and *functional*, based on the etiology, is the most practical and rational. As for the relative frequency of the various types, it has been determined in a compiled series of 10,000 cases gathered at the Mayo Clinic, to be, in the above order, 14%, 22%, 37% and 25% approximately; the rest were undetermined.

I. DYSPEPSIA—the result of *organic* disease of the stomach or duodenum.

(a) *Peptic Ulcer*—the most common cause of dyspepsia, more so between the ages of 30-60, and especially in the male. The food-comfort-pain rhythm of duodenal ulcer, and the food-comfort-pain-comfort rhythm of gastric ulcer with their periodic exacerbation are well known. However, pain is present in only 90% of cases, the other 10% complain of nausea and vomiting, gas or distress, or an "all gone" feeling, coming on with a definite time relation to the ingestion of food. Although these symptoms are characteristic of all ulcers, that they may be easily attributed to another cause is understandable, since only 80% of ulcers can be seen radiologically. If bloody vomitus or a tarry stool appears, the diagnosis is established, but if the symptoms are not alleviated by appropriate treatment, a complication of another lesion must exist.

(b) *New Growth*—Gastric carcinoma is the cause of 6% of all dyspepsia. A history of vague indigestion of longer than two weeks duration or a history of chronic indigestion with recent change in symptoms in any one over 40 years of age are suggestive of new growth. Many patients have as their first symptom a definite sensation of having an empty stomach, one or two hours after eating, a hunger-like distress which is indistinguishable from that of a benign ulcer. This distress is epigastric in situation, very frequently is relieved by food or alkalies and may be periodic. Objectively, diminution of gastric acidity, the appearance of occult blood in the feces on a meat-free diet, are significant of gastric carcinoma. X-ray will reveal carcinoma in 98% of cases.

(c) *Duodenal Spasm* (duodenitis). Clinically, the complaint is one of less definitely localized pain, relieved by the taking of food or alkalies but not to the same extent as ulcer. The presenting symptom is often nausea rather than pain, accompanied by a distressing sense of fullness in the right upper quadrant, appearing after meals. Since this condition similates ulcer so much, it can only be differentiated by the absence of an ulcer at operation or by the

characteristic X-ray findings of increased spasticity and hypermotility, namely indentation, deformity, and a hazy ill-defined shadow of the duodenal bulb.

(d) *The remainder* of this type all may produce dyspeptic symptoms none of which are significant. In *pyloric obstruction* there is a succession splash, visible gastric peristalsis, frequently crampy epigastric pain and vomiting of retained food along with large amounts of secretion. Retention is revealed by prolongation of emptying time of a barium meal beyond six hours and eventual dilatation, as well as lactic acid, and Boas-Oppler's bacillus in a test meal. *Diaphragmatic hernia, foreign bodies* and *adhesions* can only be diagnosed by a gastric series, even though a history may be suggestive.

II. REFLEX DYSPEPSIA due to stimuli originating outside the stomach or duodenum. There are so many causes of this type that only the more important will be mentioned.

(a) *Appendiceal Dyspepsia.—Most of* us have seen more normal-appearing appendices removed than abnormal ones, and are at a loss to understand the physiological basis of the production of symptoms of indigestion by a chronic or subacute appendicitis. It has been determined that the appendix is the cause of dyspepsia in 2%–5% of all cases. An individual gives a history of remote "stomach aches" or of chronic indigestion and subsequently has an "attack" accompanied by localizing symptoms. Removal of the chronically diseased appendix cures the "stomach trouble." In many cases removal of the appendix does not cure the dyspepsia, which must then have been due to either other lesions or functional causes.

(b) *Cholecystic dyspepsia.*—Cholecystitis is always present more or less in everybody after the age of 30, and chronic dyspepsia beginning after the age of 50 is more frequently due to gall bladder disease than any other single cause. All chronically inflamed gall bladders do not produce symptoms, and demonstration of a mal-functioning gall bladder is not sufficient reason for its removal. The complaint is of a mild epigastric distress, "gas", and a sense of upward pressure coming on, as a rule, soon after eating or at irregular intervals after meals, often of sudden onset and short duration; or there may be irregularly intermittent, prolonged exacerbations with dull pain in the epigastrium. In contrast with peptic ulcer the symptoms tend to be irregular; nothing follows in sequence, day by day, because the stomach functions properly unless irritated by the distant lesion, and that is irregular in its influence. To-day food brings relief, to-morrow food promotes pain at no regular intervals after ingestion; there may be vomiting one day and eruction and flatus the next.

Accuracy in diagnosis is 95% but this figure is reached only by the appearance of biliary colic, jaundice, or finding stones radiologically.

(c) *Pancreatic Dyspepsia.* Scant attention has been paid to the pancreas as a source of dyspepsia, but that it does produce symptoms is substantiated by the so-called "postcholecystectomy syndrome." To differentiate pancreatic dyspepsia from that of choleystic dyspepsia is difficult, because subacute pancreatis is usually associated with cholecystitis. If after cholecystectomy, the symptoms persist, and at the operation an enlarged, swollen tense pancreas was noted, then that organ may have been producing the symptoms. Usually the complaint is of bursting epigastric pain, slightly to the left of the mid-line which goes through to between the scapulae, or it may radiate around to the left; it occurs at the height of physiological activity of that organ, i.e. two to three hours after meals. It may be accompanied by a half-girdle zone of hyperalgesia, and between attacks by belching, distension and food intolerance.

(d) *Nervous System.* — Generalized abdominal pain may occur in patients with migraine, or there may be gaseous eructations and nausea and vomiting, but the characteristic prodromal symptoms of migraine should direct attention away from the digestive tract. Labyrinthine disease, glaucoma and refractory errors of the eye produce reflex symptoms that are misleading. Intra-abdom-

inal lesions are irritated by the pain of the gastric crises of the syphilitic; the pain radiates along the line of the ribs and ceases at night. There may also be periodic vomiting, but the absent knee jerk and pupillary reflex uncover the source. Involvement of the posterior nerve roots from spondylitis and arthritis causes confusing radicular pain whose origin will be suggested by the relation of the pain to rest, exercise and posture. Space-taking intra-cranial lesions have nausea and vomiting amongst other symptoms, but they may be the only ones complained of.

(e) *In coronary heart disease* there may be anorexia post-prandial epigastric distress and nausea, and sooner or later it comes on if he takes a walk, but it may be absent if he rests after a meal. There may be belching and bloating and other gastric and intestinal upsets. The pain and nausea and vomiting of coronary occlusion have caused many patients to be prepared for operation before a diagnosis was made. Pain of diaphragmatic pleurisy may be referred to the epigastrium; a clue to the cause will be found in its relation to respiration and deep breathing. Fibrositis of the upper recti abdominis muscles causes a pain that may simulate ulcer, but it is rarely localized and tends to shift; tenderness to pressure is greater when the muscle is in a state of contraction rather than when relaxed as in abdominal diseases. Lower right or left abdominal discomfort may precede a frank attack of ureteral colic by months. Hernia, retroflexion and tumors of the uterus, colitis and vomiting of pregnancy all produce reflex symptoms that lead to errors in diagnosis.

III. DYSPEPSIA—the result of *systemic* disease.

(a) *Infection.*—About 6% of patients with pulmonary tuberculosis have gastro-intestinal symptoms denoting the onset of the disease. The chief disturbances are a loss of appetite of variable degree, nausea, vomiting, epigastric pain and discomfort, and constipation. Focal infection and walled off pyogenic infection also produce similar symptoms, but they may act reflexly. The latter usually produces sufficient local and constitutional symptoms to warn one of their presence and to lead to their discovery. The former will be missed unless a thorough examination of the chest is made and even then, tuberculosis will not be recognized in many cases without a chest plate.

(b) *Chronic Glomerulorephritis.*—Whether uraemia exists or not, these cases may develop anorexia, nausea, vomiting, and loss of weight. In the uraemic state there may be attacks of abdominal pain, usually mild but occassionally acute, diarrhea, and haemorrhage as the result of gastro-intestinal ulcer formation. Diagnosis should not be difficult.

(c) *Diseases of the Endocrine Organs.*—In both Addison's disease and exophthalmic goitre there is nausea, vomiting and diarrhea during the crises. If the pigmentation, asthenia and hypotension of Addison's disease or the exophthalmos, tremor, nervousness and enlarged thyroid of exophthalmic goitre are not prominent, the nature of the gastro-intestinal disturbance will be misinterpreted, and another condition diagnosed. Diabetic acidosis also has dyspeptic symptoms.

(d) *Deficiency Diseases.*—Pernicious anemia, sprue and pellagra are good representatives of this type; symptoms are vague, but consist mainly of loss of appetite, diarrhea, and occasionally nausea and vomiting. They should not be missed.

(e) *Congestive heart failure.*—Often before the more prominent signs of congestion become apparent, the patient will complain of anorexia, a sense of epigastric fullness after meals, gaseous distension, or epigastric discomfort of variable degree.

(f) *Exogenous Poisons.* Indiscriminate use of alcohol, tobacco, tea and coffee will cause variable disturbances, such as epigastric distress and belching. Noxious gases, such as carbon monoxide, or sulphur dioxide, and lead, are other common poisons. In these cases a good history is invaluable, as it is in case of food allergy where every sort of dyspeptic symptom has been observed. This condition is especially difficult to

differentiate unless there is a family or personal history of allergy. The detection of the offending substance is made chiefly by elimination diets, skin testing or digestive leukocyte response.

IV. DYSPEPSIA—the result of *functional* gastric disturbances.

The diagnosis of functional dyspepsia can only be made when no change in the organs or tissues of the body can be demonstrated. A follow-up of a large series of functional cases reveal that the diagnosis is wrong in 1 to 15 cases, and the lesion most likely overlooked was either peptic ulcer or gall bladder disease. This error can only be avoided by a careful history and painstaking general examination. After this special attention may then be directed to the patients' heredity, habits of living and eating, of worry, of sleep, of conditions of hysterical manifestations, and of self-medication.

(a) *Habit Dyspepsia.*—The symptoms are the result of faulty physical habit such as over-eating, under-eating, eating irregularly, over-work, constipation, eating improperly cooked foods lack of occupation and exercise, insufficient mastication. Secretory and motor disturbances predominate, and can only be corrected by a well controlled regimen.

(b) *Gastric Neurosis.*—The influence of mental states on digestive function is common knowledge. Emotional disturbances may provoke immediate anorexia, nausea, even vomiting, inhibition of the secretions or constipation and diarrhoea, as we all have experienced. These tend to be transitory, but may precipitate a gastric-intestinal neurosis. The digestive tract is the point of origin of major symptoms in one-third of neurotics. In this group belong the anxiety states, hysteria, hypochondriacs, morbid fears, and the so-called chronic nervous exhaustive condition. Females are more prone to develop functional gastric disorders, whereas the males have organic lesions more frequently. The symptoms may be those of any organic disease and they tend to be continuous but frequently vary from time to time. Noisy eructations are in 90% of cases the result of the habit of swallowing air, and releasing it in an attempt to relieve a passing discomfort. People in this group are the ones who suffer from mucous colitis, spastic colitis, and hysterical vomiting. It is they who return for repeated operations, and frequent the outdoor clinics of all hospitals; you give them much explanation and reasons, but all to no avail. They should not, however, be passed by without a thorough investigation or an organ lesion will be missed.

(c) *Constitutional Inadequacy and Asthenia.* In this group are thin, nervous, flabby, weak bodied individuals who never have been strong and never will be. Any of the digestive disturbances may be present. The great neuropathic disposition, the hyperexcitability, the great asthenia and hypotonia of the muscular system are further evidenced by the fatigability, emotional instability, malnutrition, headache, constipation, insomnia, neurocirculatory dis turbances usually accompanying the indigestion.

In conclusion, stress must be laid on the completeness of a history and a thorough investigation of all the systems before a diagnosis of functional dyspepsia is made. Also advice to the public should be given of the risk they take when they seek to relieve an ailing stomach by heeding the subtle promises of some radio announcer, side-show charlatan, or other vendor of therapeutic nostrums.

Feature Section

ALAN VAUGHAN, Editor

PROSPECTIVELY M.D.

By G. W. FITZGERALD, B.A. '44

More than being just doctors, I believe, most medical students want to be good doctors. However nebulous, the majority probably hold to that as an ideal. But how?

Two tasks, in my view, confront the student in his climb to medical practice. His first and most important job is to learn his work as well as he can; the second is to know the people on whom he will apply it.

First, the learning aspect. To learn takes effort and in medicine a great deal of effort. Hard work and plenty of it is to me the first thing to which medical students must get accustomed. Once believing that however, and applying it, the medical student needs something more. That something is time. If only he had more time! But he hasn't, so must make the best of what he has meted out to him. He must do this by a method of planned work. There are many scientific ways of doing this, of working so long and resting so long, methods of reviewing the facts, time economizers for learning; but these can be found in a text-book of applied Psychology.

Why, therefore, not take another method, perhaps more interesting. Why not find out how successful men manage their time? Why not see how men who are learning and have learned the facts which the medical student must learn—and many more—arrange their time.

With this view in mind I approached three men, each a success in the greatest sense of the word, each world famous in his own particular field, each a man who has made the most of the time he has had at his disposal, and has much in black and white to show for his labour. They are Professors Grant of Anatomy, Best of Physiology and Boyd of Pathology, in the order met as one passes through the University of Toronto's School of Medicine.

First Professor Grant in his office in the Anatomy Building was approached.

"What", I asked, "do you think about planned work—what system did you use when building up material for your book 'A Method of Anatomy'?"

In indirect but dramatic reply came a quotation from a book by Beverley Nichols called "Twenty-five", in which a conversation took place between the author and a certain Mr. Churchill.

"When asked by the 'Man of Today' (to steal Professor Grant's phrase for Churchill) how long it had taken to write his novel 'Prelude', Beverley Nichols replied he hadn't the least idea because it was done in patches over a period of five months.

"Didn't you work at it regularly?" asked Churchill.

Nichols replied that he didn't see how one could do work in that manner and be inspired.

"Nonsense", said Churchill. "You should go to your room every day at nine o'clock and say to yourself, 'I am going to sit here and write for four hours' . . . if you sit waiting for inspiration you will wait until you are an old man. Writing is a job just like any other." . . .

Added Dr. Grant—"like being a student".

In short, Dr. Grant meant that not feeling like it was no excuse for not working. Further he said that one put oneself at a distinct disadvantage by putting off

the learning of material—when it was taken in class was the ideal time to learn it.

As to Professor Grant's skill at organizing, one needs only to listen to a single lecture of his to notice that it contains system and clockwork precision.

Next I went to Professor Best in his office at the School of Hygiene.

Suggestion one, on the saving of time and effort, was a novel one. "Read the Journal Articles", he said, and added that much of what he wanted to know for exams he would find in select Journal articles—in concentrated form. After hearing a topic discussed in lectures, he would search through his files of Journal articles pick out the pertinent article, and this summarize and keep. Summarizing of books —personal summarizing, Dr. Best thought, was the solution to much labour. He told of how when a student, he made a summary of each chapter of the current Physiology text-book and pasted it into his book at the end of each chapter.

Another interesting sidelight by Prof. Best was his suggestion that the student study the professor. "Find out his pet subjcet, or his current interest—work it up. Chances are it will be on the exam."

"And try as we will, said Dr. Best, there is always a tendency to repeat questions of previous years". The thing to do here, he thought, was to go over previous exam questions early in the year then when they are taken up in lectures will be recalled and the lecture more attentively listened to.

The heavy subjects, Dr. Best said, he made a point of working on systematically throughout the year. Instead of being behind the professor in reading the text, he kept ahead. He would buy the book early and be well on the way when the course started.

But best of all, he repeated, was the suggestion that the student read Journal articles—to get more material into one head in less time.

And finally, to Professor Boyd's office in the Banting Institute, I went.

Quizzed as to the medical student's problem of organizing his studies, this head of the Pathology Department, after modestly attempting to slip into an impersonal guise by referring me to his Manitoba successor's paper on how to study, graciously submitted his own startling methods.

To the query, "How did you organize your time when doing all the work of preparing the material for Pathology books", Professor Boyd said that he did most of it in the early morning, rising at 5 a.m. (From Dr. Grant I had previously obtained the lead that Professor Boyd had done all his hard work between "sunset" and "sunrise"). Professor Boyd went on to recount that from 5 until 8 o'clock in the morning he was able to do as much scientific work in three hours as in any other part of the day; and as for his time schedule those hours worked best. He was at work in the hospital all day, often had meetings and social events in the evening.

"How much sleep did you get?"

"About six hours."

Some people, Professor Boyd said, needed more than that, but many getting ten hours a day were wasting their time. Training to get used to six hours sleep is possible.

If out for an evening, at 11 p.m. he would say his goodbyes and return home to retire and rise at six, thus getting his quota of sleep—("except of course, when at a dance or something like that"!)

A striking tip on Dr. Boyd's technique for summarizing was his method of enumerating important pages of a book on the empty page at the back. Choosing at random a number on this back page he showed me how he could turn to that page in the book to find a short paragraph which he said was important to him.

"Work in shorter shifts", advised Dr. Boyd. If a student plugs before an exam from seven p.m. until three a.m. most of the material he will take in will come in the seven to eleven shift, the rest of the time is wasted but could be of value in the morning after six hours sleep.

As for review for exams his method was to take the index of one's text and

work through it, checking oneself thus: Points known for sure should be passed by, points unsure revised by reference to the pages noted.

* * *

In these three men stand out boldly qualities of hard work and systematic organization. Evidently these two qualities make for success.

* * *

The second big job of the medical student is to know people.

No young doctor in general practice, because his record shows that in medical school he learned his work well, can be assured that he will be a good doctor. He must, I think, have something more, something he doesn't get within our medical halls of learning, yet something vitally essential. He has to know people.

He has to know people because it is people he will be treating, people to whom he will be giving new health. His practice is not just diseases, or wounds or births, but people, on whom these events are superimposed, people, no two of whom are exactly alike.

Of course it goes almost without saying that this understanding of people is secondary. Unless the young medical graduate speaks anatomy, physiology, pathology and all the rest with the versatility with which he speaks English, then this knowledge of people is of little value. Knowing people, their thoughts, feelings, and actions, never did and never will make a physician of itself. So it seems the prospective M.D. has a double duty, either task alone is not easy. Together they constitute a life work of endless effort, require a never-ending devotion to duty.

Few would say that such a demand did not call for extreme sacrifice. Who cares about sacrifices, I would reply when one is interested in his job? What greater satisfaction than when one's aim is obtained? Who will become upset about his lack of future divertisement, being this all-faithful servant, if once he realizes that he is living ten lives in one? But the point for the undergraduate, and especially the pre-clinical undergraduate, is to be convinced that he will lead ten lives in one. A considerable fraction of the time he doesn't even, he believes, lead one small part of one normal life.

It is because of this factor that he is apt to grow just a bit disconsolate, to wonder whether perhaps he is missing the things in life that are most worth while, youth, gaiety, romance, life itself. In the words of Tennyson:

> *"Why not bask amid the senses, while the sun of morning shines,*
> *Youth and health, and birth and wealth, and choice of women and of wines?"*

Perhaps in just this mood he wanders a bit astray, then feels that he is far behind in his work and worries much about his lack of concentrating power. Perhaps, being less impulsive, he only dreams of the things he would like to do, and so wanders in a mental world (a much more dangerous and wishful pursuit, without any of the attributes of the former).

Thus then the student's dilemma.

For the way out my "theory" points toward doing just what the medical student thinks he never has time to do, that is "living". For in living he is not only doing what he wants to do, but something far more—he is growing to know people by mingling with them. This latter, besides being an interesting aspect of life, I think is something that every medical man will require and use almost every day of his life.

When, for instance, the future health of a patient demands surgery, it is he who must convince that household, not in the foreign language of medicine, but in phrases understood in a very untechnical home, what is at stake.

When a section of a community is exposed to epidemic, with his pleading

for special preventive routines he can help save the day—but what avail his pleading if he doesn't understand the outlook of these humans, if he hasn't learned to speak their language?

If he understands people, the M.D. can distinguish the patient who wants to know what is going on from the non-quizzical type, and so will know when to explain and when not.

Further, he will be able to distinguish the neurotic type from the stable stoical type of patient and if he understands people he will know whether the symptoms he hears recounted to him are more physical or more mental; and thus will be able to proceed in his treatment accordingly.

Some may believe that this understanding of people is something that will come out of the blue—that with experience it comes as intuition. Rather, I think, it must come through intelligent putting together of two and two; a direct positive attempt to comprehend an outlook. To do this one doesn't have to be a so-called Psycho Analyst—rather he just needs a certain degree of wholesome interest.

Knowing people, to me, means mingling with them socially, eating with them, skiing, skating, talking with them, finding out what they think, and how they think. I mean all kinds of people—high and low, old and young, rich and poor, most important of all the variations of the great middle class. In this way can be built up for the future physician a fund of knowledge about the actions, attitudes, thoughts and beliefs of all types. With each new type he meets, he can say to himself with reasonable sureness, "Some day, I am going to have to treat a patient such as he." The time to start doing all this is now.

By simply taking the desire to live that burns in the depths of the youthful Med., merging it into a requisite for becoming a medical doctor with insight, is devised a scheme that transforms a formerly handicapping desire into a stimulant that will increase ability to become a better medical practitioner. This urge, usually thought detrimental, is utilized by the young student to help him not only enjoy life but to be of greater value to the world.

Abstracts

R. L. MacMILLAN, Editor

Contributors J. G. Watt
D. J. Breithaupt
D. P. Bryce

Bulletin of War Medicine

Attention is directed to this publication of the Medical Research Council of Great Britain. It will be published about every two months. Two issues have been received already by the Medical Library. The purpose is to collect together contributions to war medicine, that appear in the current literature of all countries. The material is grouped under different sections such as wounds of the head, aviation medicine and hygiene. By reading this bulletin the student may, without much effort, keep up with the trends and new developments in the field of war medicine. Some papers have only been abstracted and the student will have to look up the original paper for full information. Others are summarized and supplant the original article to fulfil the ordinary reader's needs. This is particularly so where the article is in a foreign language.

War Medicine

The first issue of a journal by this name, published by the American Medical Association, has recently appeared on the newstands. It is published under the imposing editorship of the Committee on Information of the Division of Medical Sciences of the National Research Council. Its purpose is to disseminate information on medical preparedness and war medicine to physicians who are not familiar with the special problems connected with this branch. It contains original contributions, reports by special committees and pertinent abstracts.

A New Treatment Highly Suited for Wounds of Modern Warfare

J.A.M.A., Editorial, 1940, 115

The closed method of treating compound fractures and infected wounds by the application of plaster of Paris casts is useful for modern warfare with its numerous civilian as well as military casualties.

This method is based on rest to the injured part and the ability of the body to resist infection. Compare this to the Carrel-Dakin technique of irrigation with antiseptic solutions as was used in the last war. Winnet Orr was the first to introduce this method and he obtained good results in 85 to 90 per cent of compound infected fractures in civilian practice. The essential feature is complete immobilization of the soft tissues. No attempt is made to kill the organisms by external agents. Trueta, the chief surgeon of the Catalonia General Hospital, was the first to use this method on a large scale during the Spanish War. The total number of cases treated was 20,000. The incidence of gas gangrene fell markedly.

Surgical treatment is carried out as soon as possible after the injury. The patient is anaesthetized, the entire wounded extremity is carefully washed, the wound with soap, water and nail brush. All hair is shaved and the skin painted with a weak solution of iodine. The skin edges of the wound are excised and there is very careful debridement removing all dead and contused tissue, especially dead muscle. The neighbouring cellular tissues are opened up, all foreign material is removed, the fracture is reduced by traction, the wound is dressed with sterile gauze then the wound and the two adjoining joints are immobilized in plaster. The plaster is applied by Bohler's method directly to

the skin, only the bony prominences being padded. The plaster is left in position as long as the smell is not excessive, and the plaster is not softened or too wet. This means for four to six weeks before the plaster is replaced.

In Trueta's own material there were 1,073 cases of compound fractures of limbs, six fatalities, 976 good or satisfactory results and 91 poor results. Dr. Rudolph Matas speaks very highly of the method. He says: "The stench of the soiled encasement was nauseating. A mush of decomposing pus and secretions covered the surface of the wound under the plaster. After washing this off with warm water and soap, and when the packs were removed, I was surprised to see the excellent, healthy, pink, well granulated appearance of the wound, coupled with the very satisfactory condition of the patient's—no fever, no pain, and good appetite."

The rational of treatment is based on: (1) Rest which allows local venous and capillary thrombi to form, so that spread of infection is delayed or prevented. New capillaries can form which are not torn down by repeated dressing of the wound. (2) The plaster maintains a beneficial pressure on the wound. The calcium in it may be of local value. (3) The mixture of organisms on the wound may by their mutual antagonism prevent the victory of any one group. (4) Leaving a deep wound uncovered causes dehydration and loss of heat, leading to shock.

The success of the method depends upon a rigid asceptic technique, especially careful debridement.

J. G. W.

Resuscitation of the Asphyxiated Newborn Infant

J. D. RUSS AND R. A. STRONG
New Orleans

American Journal of Diseases of Children, 61: 1 Jan. 1941

This short article describes a routine for the treatment of asphyxia of newborn infants. Asphyxia is divided into mild, in which movement of the head and limbs is resisted and there is a mucous plug or amnionitic fluid in the mouth or pharynx, moderate, where there is no muscle tone, the mouth is readily opened, and there is no reflex irritation on aspiration, or stimulation of the glottis, and severe, which may be livid or pallid, does not respond to efforts at resuscitation, there are no respiratory movements, and only an occasional cardiac impulse.

A brief discussion of the causes of asphyxia is given, morphine and pentobarbital sodium (nembutal) being especially mentioned as predisposing to asphyxia if given to the mother ½ to 8 hours before birth of the child. Caesarean section also seemed to predispose to asphyxia.

Important points of the routine are as follows: warmth and gentle skin stimulation with aspiration of nostrils and pharnyx, then alpha lobeline gr. 1/20 by umbilical vein, intratracheal catheter with aspiration and forced respiration by the attendant's own breath, Easton and Johnston respirator with forced respiration, Coramine m.ii subcutaneously to maintain respiration, and epinephrine m.ii subcutaneously to support the circulation if necessary. Of these, the intratracheal catheter is emphasized as the important one in general practice, and should be known by all medical graduates who may see asphyxia of the newborn.

The survey covered 1,200 cases, of which 196 had asphyxia of some degree, and 8 died; one had moderate asphyxia, 7 had severe asphyxia; and the cause of death was given as intracranial haemorrhage 3, atelectasis 3, and prematurity 2.

D. J. B.

The General Practitioner and Venereal-Diseases Control in Urban Centres

L. A. PEQUEGNAT
Deputy M.O.H., Toronto

Canadian Public Health Journal 32: 18 Jan. 1941

This is a short article on the workings of the Venereal Disease Prevention Act of Ontario in its application to the general practitioner. It is pointed out that the

M.O.H. can order an acutely infectious person into hospital, and can order examination of any persons in custody, and may detain in custody for treatment those found infected. The secrecy which the Act orders, and the fact that no report of the court proceedings may be published in any newspaper are pointed out as protection to the physician who reports the case. The necessity of tracing sources of infection, and contacts is particularly mentioned, in which respect the physicians often are careless. No physician need receive patients with venereal disease for diagnosis or treatment unless it is his wish to do so, but a diagnosis, even if the case is rejected or referred for treatment elsewhere must be followed by notification.

D. J. B.

Treatment of Congestive Failure in Children with Acute Rheumatic Fever

WALSH AND SPRAGUE
J.A.M.A. Vol. 116 No. 7

This is a study of forty-four consecutive cases. Such a condition was fatal in 72 per cent of their cases and thus the necessity of proper treatment is essential.

Their patients were first put to bed with restriction of fluids to 1200 c.c. per day and no extra salt. Then the following drugs were used and compared as to their affect on heart failure.

It was determined that the xanthine derivatives should first be used, the best of which was Theocalcin. If these fail, they advise the use of digitalis. They emphasize the sensitivity of these patients to digitalis and advise concurrent use of electro-cardiograms.

Finally if the heart failure continues to increase salyrgan is given, 1 c.c. once or twice a week. It is advisable to discontinue the digitalis as long as possible prior to giving mercurials.

D. P. B.

Carcinoma of the Lung

By OCHSNER AND DE BAHEY
Arch. Surg. 42: 209 Feb. 1941

This is a most complete and modern review concerning all phases of bronchogenic carcinoma. It should be of considerable value to the student.

This tumour is one which has only recently been recognized as of extremely common occurrence, second only to gastric carcinoma and only recently has it become operatively hopeful. Its incidence is increasing both absolutely and relatively.

Many etiological theories are reviewed. The authors state that the relative increase of this tumour, has its most important connection with the increased smoking habit, particularly inhalation, among the general populace.

An interesting etiological classification of the tumours based on embryological aspects is presented, where the cells originated from the primary "reserve cell" of the bronchial mucosa and may differentiate into either a cylindrical cell type or a squamous cell type.

The authors particularly point out the absence of characteristic symptoms and signs so that any acute respiratory infection not subsiding in a reasonable time in patient past 40, must be considered malignant until proven otherwise.

The value of X-ray and bronchoscopic studies in early diagnosis is reviewed, and in conclusion the author maintains that the only logical therapy is pneumonectomy with removal of regional lymph glands. Various forms of radiation therapy are of value only as palliative measures in the hopeless cases.

D. P. B.

Fractures of the Tibial Condyles

By BICK
Journ. Bone and Joint Surg., Jan. 1941

Sixty-one fractures of tibial condyles have been reviewed. End results with respect to the type of fracture and treatment have been investigated in 33 cases. This group of fractures is commonly known as the bumper fracture because it so often results from being hit by an automobile.

The author has concluded:

(1) Operative interference is seldom necessary except where extreme displacement has occurred.

(2) Lateral instability of the knee joint is usually temporary and even if permanent does not detract from the function of the knee joint.

(3) Plaster immobilization of the fracture must be maintained until evidence of union is demonstrated by X-ray. Usually 6-7 weeks is enough.

R. L. M.

Dyspepsia in the Army

PAYNE AND NEWMAN

B. M. J. Dec. 14, 1940

Indigestion presented the biggest medical problem among the sick invalided back to England from the British Expeditionary Force. This article is the preliminary report of a committee who investigated the problem. 287 cases of dyspepsia in the army were investigated. Of these 226 proved to be ulcers and 21 more probably were. They found:

(1) 92 per cent of the ulcers were present before the war. Only 8 per cent originated in the army; the vast majority only relapsed.

(2) The age of onset of ulceration was early. In 40 per cent of cases it was below 25 years of age.

(3) A large proportion of the ulcer cases were in reservists who had not been examined very thoroughly but were rushed into the army.

They concluded that the breakdown in the ulcer was caused by heavy army food. There was probably a deficiency in vitamin C. Teeth for chewing are important, 38 per cent of ulcer patients had inadequate teeth. Psychological factors do not seem to have played an important part in the breakdown. There were a certain number of genuine neurotic disorders but malingering was rare.

R. L. M.

The Clinical Value of the Serum Amylase Test

By E. LEWISON

S. G. & O. 2: 202 Feb. 1, 1941

Tests of biliary and kidney function are of great value. Serum amylase estimation may prove to be equally valuable in cases of obscure pancreatic disease. Amylase is the enzyme that changes starch into sugar. The validity of this test is suggested by the following observations:

(1) Ligation of the pancreatic ducts results in a prompt and marked rise in the level of serum amylase.

(2) Complete pancreatectomy causes a marked reduction of serum amylase to one-half or one-third of its normal value.

(3) Close correlation has been found between the level of serum amylase and pancreatic disease.

From this it may be concluded that serum amylase at least in part comes from the pancreas.

The methods of measuring amyolytic activity are discussed and the need for standardization is stressed. Serum amylase levels were investigated and recorded for 720 patients of widely varying age, sex and illness. It was found that 94 per cent of those not having mumps or diseases of the biliary system were normal. Mumps causes a moderate elevation. Liver disease causes a depression. Pancreatitis causes a marked elevation which is not likely to be confused with other conditions: the peak is reached in 48 hours and it returns to normal in several days.

R. L. M.

Heparin in Thrombosis and Blood Vessel Surgery

By GORDON MURRAY

S. G. & O. 2a: 340 Feb. 15, 1941

Heparin has been shown experimentally to prevent thrombosis; this paper shows how it has been of value clinically. Heparin administration produces no toxic effects but unfortunately has an evanescent action. The clotting time of a patient will return from fifteen minutes to normal inside of an hour after the injection has been stopped. Indications for the use is where it is desirable to prevent thrombosis in a vessel or extension of a pre-existing thrombus. A contra-indication to its use is where a patient has active bleeding from an open vessel.

In Metrorrhagia and Impotence

"A.P.L."
No. 500
500
INTERNATIONAL UNITS
PER CC.

potent . . . pure . . . economical . . . painless on injection

Physicians will find that "A.P.L." No. 500 provides a highly potent, standardized and economical preparation of chorionic gonadotrophin which, because of its extreme purity, is comparatively painless on injection. This product is especially valuable for the treatment of conditions such as metrorrhagia and impotence where high dosage is usually necessary.

When lower dosages of chorionic gonadotrophin are indicated, as in Fröhlich's syndrome, cryptorchidism, etc., "A.P.L." No. 488 (100 International Units per c.c.) is recommended.

Special literature available on request.

"A.P.L." – No. 500
500 I.U. per c.c.
In 5 and 10 c.c. vials

●

"A.P.L." – No. 488
100 I.U. per c.c.
In 10 c.c. vials

Ayerst

AYERST, McKENNA & HARRISON LIMITED
Biological and Pharmaceutical Chemists
MONTREAL CANADA
905

Interesting case histories are included in this paper illustrating its value in arterial suture, arterio-venous fistula, venous grafts and embolectomy. It has also been used in mesenteric thrombosis, thrombo-phlebitis and pulmonary embolism with considerable benefit.

R. L. M.

Sulfonamide Therapy as an Aid to Surgery

By LOCKWOOD

S. G. & O. 2a: 307 Feb. 15, 1941

The author discusses the theory of action of the sulfonamide drugs. They produce bacteriostasis by inhibiting the enzyme system that provides food for the bacteria. The bacteria are prevented from multiplying and finally starve. Par-amino benzoic acid has been shown to be an essential food-stuff for the bacteria. A struggle is depicted between the enzymes of the bacteria and the drug for this food-stuff. If the concentration the drug is low the enzymes will win and the bacteria will flourish but if the concentration is large the drug will win.

Bacteria, which digest tissue rapidly, release large amounts of par-amino benzoic acid and other foodstuffs. Where this occurs the blood level of the drug must be high to be bacteriostatic.

The author discusses three principle factors that modify the curative action of sulfonamide compounds.

(1) The concentration of the drug maintained in the proximity of the bacteria.

(2) The mobilization of cellular defence.

(3) The concentration of sulfonamide inhibitor substances. This is most important from a surgical standpoint. Excess of enzymes and foodstuffs inhibit the action of the drug. After localization of an infection has occurred and tissue necrosis and digestion have taken place, inhibitor substances are produced in large amounts. Surgical drainage will remove these substances and allow the drug to clean up the infection.

R. L. M.